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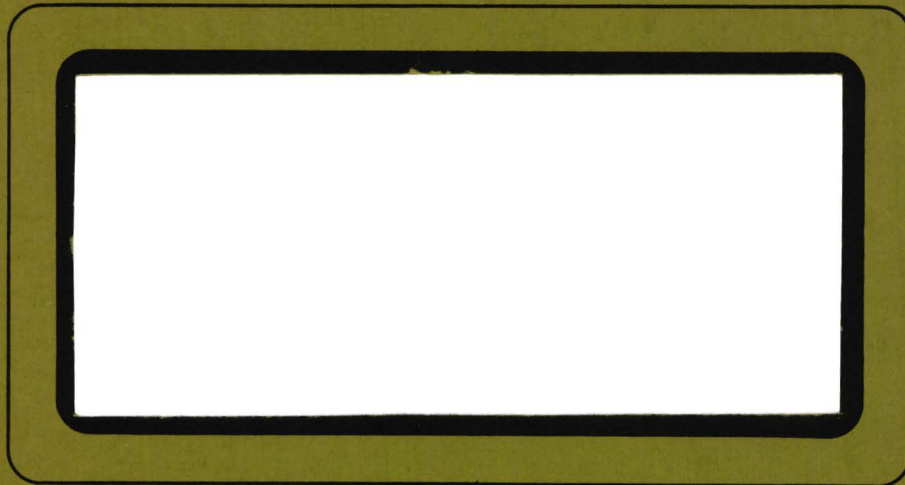
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CURRENT STATUS
OF
DEER SPRING RANGES
AT
WHITWORTH AND PONDEROSA MEADOWS,
LOWER SKAGIT VALLEY

BY
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FOR
MINISTRY OF ENVIRONMENT

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1.0 INTRODUCTION

In January, 1986 the Fish & Wildlife Branch submitted a report to the Skagit Environmental Endowment Commission concerning the status of wildlife data in the Skagit watershed (Barnard, 1986). Included in that report were proposals to obtain identified data deficiencies and a request for funding to undertake such studies. Among these was a proposal to determine the present day status of known deer (Odocoileus hemionus) spring ranges in the Lower Skagit Valley. Subsequent approval of funding by the Commission enabled this study of those ranges to proceed.

The three primary objectives of the study were to 1) determine the impact of vegetation succession on the major spring ranges as indicated by reduction over time of the area of meadow available to deer 2) determine the distribution and abundance of vegetation species on the spring ranges and 3) compare these data to that collected for these ranges in the early 1970's. Realization of these objectives should provide a base upon which to plan subsequent range creation and/or enhancement proposals.

2.0 STUDY AREA DESCRIPTION

The two major existing deer spring ranges in the Lower Skagit Valley are located at Whitworth and Ponderosa Meadows (Gates and Caverhill, 1970; Slaney, 1973). Whitworth Meadow is located on the east side of the Skagit floodplain approximately 4.0 km (2.5 miles) north of Ross Lake, whereas Ponderosa Meadow is on the west side of the floodplain and immediately north of the lake (Figure 1). This portion of the Skagit watershed occurs within the Interior Douglas Fir biogeoclimatic zone and includes vegetation common to forests on both sides of the Cascade Mountains. As such, it has been previously described as an ecotonal area (Slaney, 1973). Soils at both Whitworth and Ponderosa Meadows have been classified as belonging to the Ponderosa soil series of the Orthic Eutric Brunisol soil group (Slaney, 1973). That study described the soils as well drained and developed on reworked alluvial granular deposits. Texture was noted as gravelly sandy loam with those of Whitworth Meadows tending to be the coarser of the two areas. More recent field investigations tend to support these observations, describing Ponderosa Meadow as having a sandy loam cap as opposed to the sandy-gravelly soil with a limited cap present at Whitworth Meadow (Maynard - personal communication).

Historical accounts of land use in the Lower Skagit Valley appear to indicate that the meadows were naturally occurring

(Perry, 1981). As such they apparently served as focal points for several abortive attempts at ranching in the area. The first such attempt occurred in the 1880's at what is now known as Ponderosa Meadow. Active ranching at this site apparently ceased in 1899. The area now known as Whitworth Meadow was first settled in 1903 but lasted only until 1910 as a viable ranching operation. Large scale logging operations began in the Lower Skagit Valley with the construction of the Silver-Skagit Road in 1946 (Slaney, 1973). During the following eight years most of the valley floor was clear-cut or selectively logged. This has been followed by a climate-induced period of relatively slow regeneration. Today a variety of forest cover types can be found adjacent to both meadows including deciduous, mixed deciduous-coniferous and coniferous. In 1973 the areas of Ponderosa and Whitworth Meadows were estimated at 9.5 ha (23.5 ac) and 5.1 ha (12.5 ac) respectively (Slaney, 1973). A subsequent investigation at Whitworth Meadow in 1983 estimated the meadow area at 3.4 ha (8.4 ac) and attributed the area reduction to seral succession (Forbes, 1983).

3.0 METHODS

Each of the three primary objectives previously outlined (Sec. I) required a specific method(s). These are discussed below in terms of each objective:

3.1 Determining the impact of vegetation succession on the spring ranges

The historical area of both meadows were determined from B.C. Forest Service map #92-H-3-a (1:25 chain). This was accomplished by using a dot grid to calculate the area of the polygons representing the meadows. Although the map was published in 1975 the polygons for the meadows were extrapolated from 1973 (1:20 chain) air photography (Ponderosa Meadow-B.C. 7469-#162; Whitworth Meadow-B.C. 7472-#22). Therefore 1973 should be considered the base year for comparative purposes.

To determine existing (1986) areas a rough survey technique was employed. This involved using a Silva Ranger compass to establish a start point in the approximate centre of each meadow. These in turn had been registered to an easily identified natural feature at each location which served as a tie point to facilitate survey replicability. Utilizing a compass and pre-selected bearings a total of eight and 10 transects were laid out in Whitworth and Ponderosa Meadows respectively (Figs. 2 and 3). A metric hip chain was then used to determine the distance along each transect from the start point to the edge of

Figure 2

Location Of Whitworth Meadow Vegetation And Area Calculation Transects

Skagit River Watershed

June, 1986.

LEGEND

--- Meadow-Forest Interface

=== Trail

Scale 1:2500

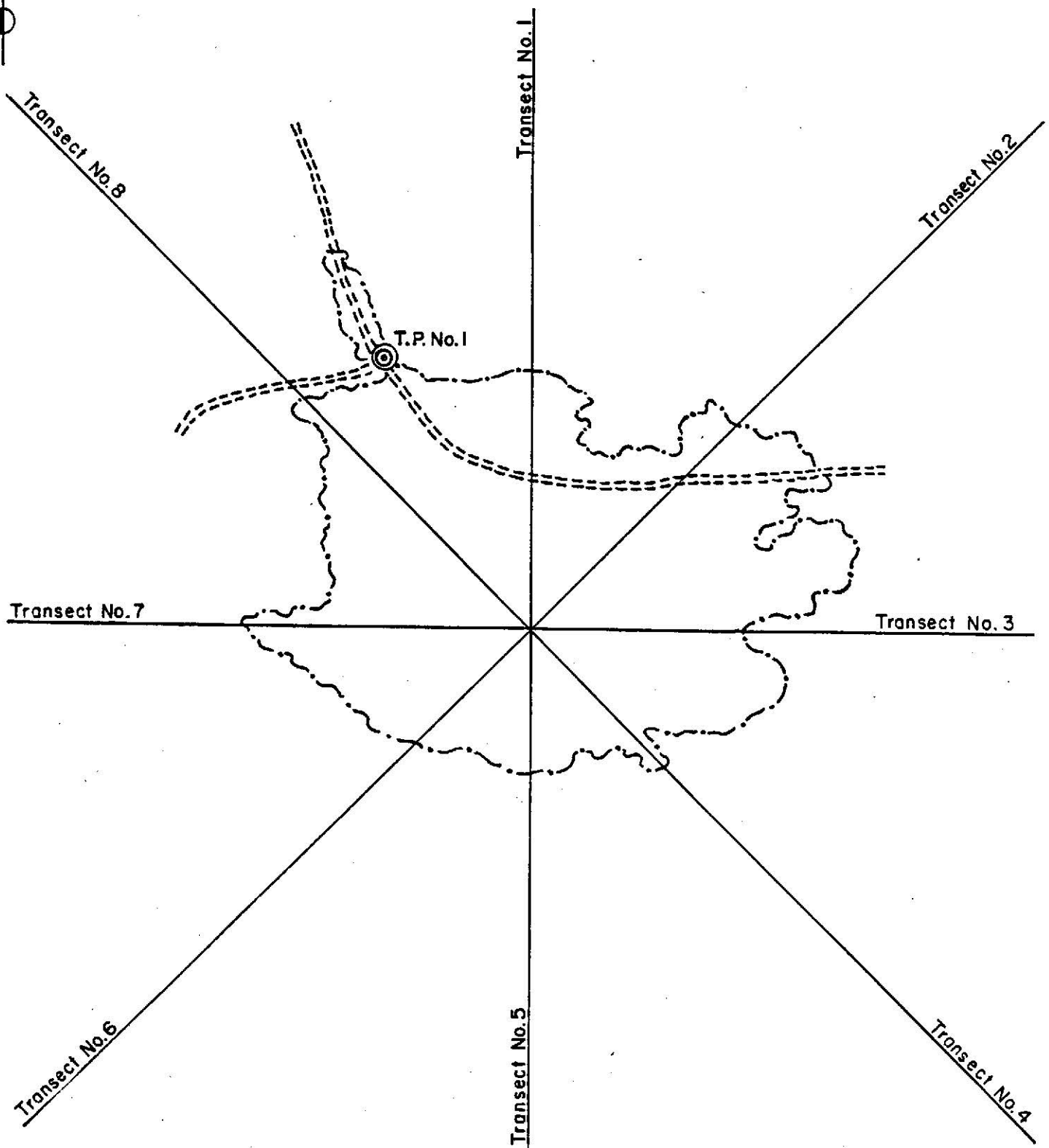
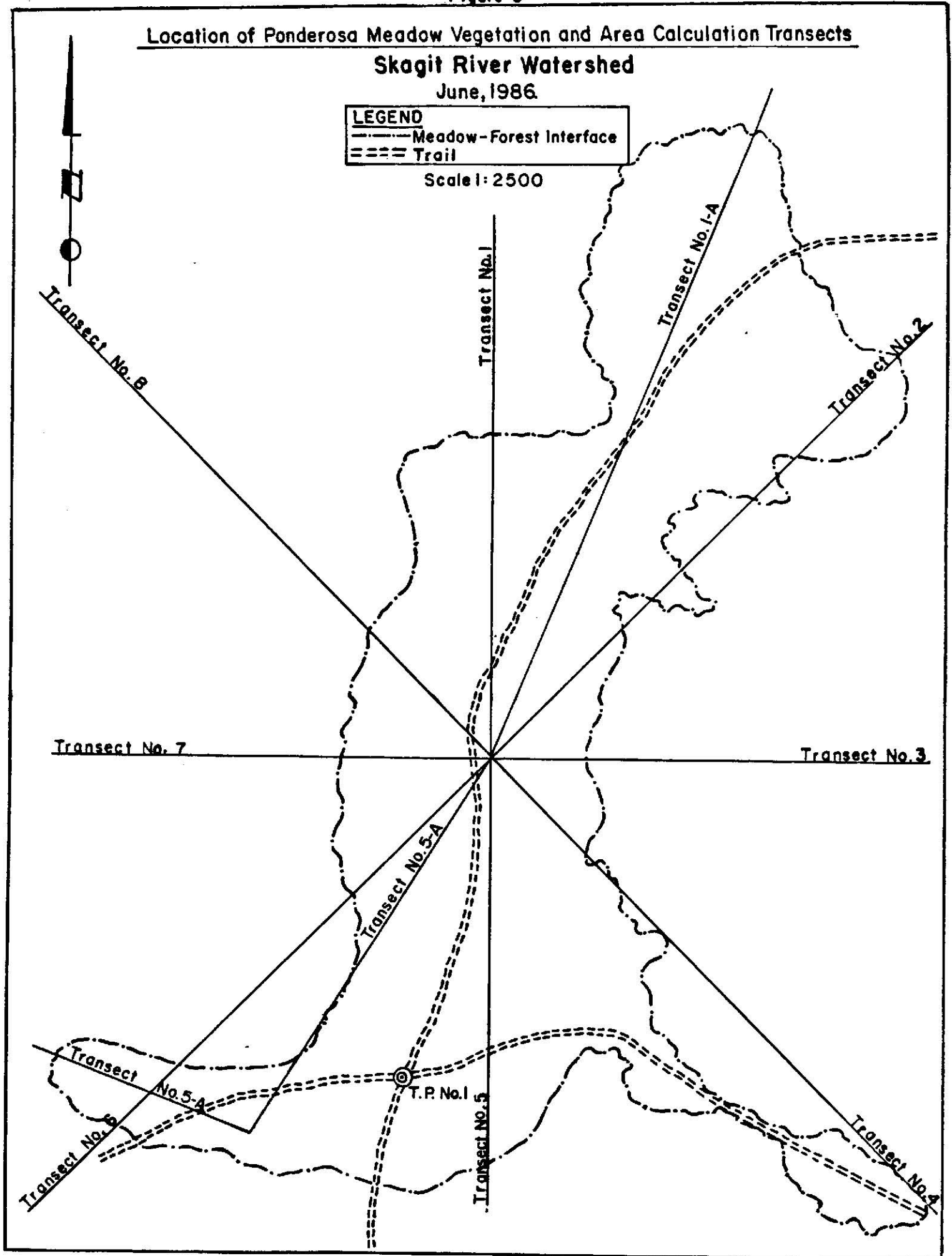


Figure 3



the meadow. The latter was defined as the point at which the grass-forb-shrub communities of the meadow interfaced with the adjacent tree-shrub communities. A sketch of each meadow was then prepared (scale: 4mm=10m) indicating transect location and the meadow termination point on each. Using recent air photography and ground checks the meadow termination points were joined to form an outline of the meadow perimeter. The area within the perimeter was then calculated using a dot grid.

3.2 Determining the distribution and abundance of vegetation species on the spring ranges.

Utilizing the transects established in Sec. 3.1 one square metre plots were established at five metre intervals along each transect. Each plot was delineated by placing a square metre frame on the substrate. The most commonly occurring plant species were then identified and a subjective estimate of percent cover by species was recorded. Unidentified plant species were collected, placed in a plant press, and subsequently identified utilizing the U.B.C. herbarium collection. Notes pertaining to utilization by deer were recorded when applicable.

3.3 Comparison of data collected with that collected for these ranges in the early 1970's.

The report "Environmental Investigations - Proposed High Ross Reservoir - vols. 1 thru 3 and 4 thru 10, 1973" prepared by F.F. Slaney and Company Limited was the primary source of historical data re meadow area and deer vegetation utilization. The pertinent sections were reviewed and applicable data extracted for comparison to the 1986 findings.

4.0 RESULTS AND DISCUSSION

Reflecting their spatial integrity the results and discussion for each meadow are presented separately below:

4.1 Whitworth Meadow

The area of this meadow in June, 1986 was calculated to be 3.3 ha (8.2 ac). This compares closely to the 3.4 ha (8.4 ac) estimated in 1983 utilizing a similar method (Forbes, 1983). Based on the pertinent 1975 B.C. Forest Service cover map, the area of the meadow in 1973 was calculated to be 5.1 ha (12.7 ac) (Sec. 3.1). This approximates the 5.1 ha (12.5 ac) determined in a 1973 study of the area (Slaney, 1973). Forbes (1983) compared his findings with those of Slaney and attributed the approximately 33 percent reduction in area to forest succession.

A comparison of this study's findings to the area calculated from the 1975 forest cover map indicates a 35 percent reduction in area.

Analysis of recent air photos, supplemented by ground inspections, appears to support the earlier contention that the meadow area is being reduced by seral succession. The most obvious encroachment appears to be occurring primarily along the south and south-western periphery of the meadow. This may reflect the increased moisture gradient resulting from the abrupt elevational change along this portion of the meadow. The preponderance of moisture-tolerant *Salix* spp. and cottonwood occurring in the invading tree species appears to support this observation. The presence of robust stands of Douglas spirea in this portion of the meadow is also indicative of a relatively high water table. Conversely, the vegetation of the remaining three plus hectares of meadow generally reflects the approximately 4-5 m increase in elevation and the resulting drier conditions. cursory inspection of the soil underlying these two elevationally disparate portions of the meadow also reveals a much coarser, gravelly substrate on the higher portion. These two factors appear to result in a vegetational mosaic on, and adjacent to, the higher portion of the meadow that is undergoing a much slower rate of successional change than has occurred on the lower portion.

A total of 215 square metre plots were established on the eight transects (Appendix 1). Plant specimens from forty-two genera were encountered and all but six were identified to species (Appendix 2). A review of the vegetation observed reflects the past land use of the site, ie. ranching, with both domestic and native grass communities present. Although an earlier study had documented species presence, no sampling strategy had been employed to measure vegetative composition in the meadow (Slaney, 1973). Consequently, no comparison of changes in composition relative to this study was possible. Similarly, the interim species lists in the 1973 study were essentially an inventory of all plant species in the Lower Skagit Valley. The species denoted in this study were only those that occurred most commonly in the square metre plots established in Whitworth Meadow. Therefore, a comparison of possible change in numbers of species encountered between the two studies would also be invalid.

No studies of deer food habits specific to Whitworth Meadow have been undertaken. However, a variety of browse species known to be utilized during the spring on nearby Ponderosa Meadow and elsewhere in B.C. were encountered (Slaney, 1973;

Singleton, 1976). These included rose, Saskatoon berry, Oregon grape, huckleberry, red-osier dogwood, thimbleberry and willow. Tree species known to be utilized elsewhere, and present at Whitworth Meadow, include Western red cedar, Douglas fir and red alder. Purple pea, lupine, dandelion, wild strawberry, yarrow and clover are forb species utilized at Ponderosa Meadow and which are also found at Whitworth Meadow. Evidence of browsing was observed primarily on Saskatoon berry, willow, rose and red-osier dogwood (Figs. 4 and 5).

4.2 Ponderosa Meadow

Due to its irregular shape a total of 10 transects were required to define the meadow perimeter (Fig. 3). Subsequent calculations indicated the present area of deer spring range to be 10.2 ha (25.3 ac). Historical records of the meadow's size appear somewhat contradictory. Slaney (1973) reported the meadow area as 9.5 ha (23.5 ac) -- or seven percent smaller than was found in this study! Unfortunately, the habitat maps from which the 1973 estimate was obtained could not be located and, therefore, the source and method of calculation is uncertain. Based on the 1975 B.C. Forest Service cover map the meadow area in 1973 was determined to be 14.2 ha (35.2 ac); however, the polygon on which this calculation is based includes several small sites which, based on ground inspections conducted during this study, appear atypical of the larger meadow area.

The first of these is a lowland area of approximately 2.4 ha (6.0 ac) separated from the south end of the meadow by an abrupt elevational change of approximately 2 m. This area is subjected to a very high water table during the peak storage period on Ross Lake and pockets of surface water are not uncommon at that time. The area is densely vegetated to willow with an understory that varies with microtopography. The second site is approximately 1.6 ha (3.9 ac) in area and is located adjacent to the extreme south-east corner of the meadow. It too is a moister site than the meadow proper and once supported a stand of large Western red cedar. After logging, probably in the early 1950's, the site appears to have been cleared but has since revegetated to a robust poplar overstory. Neither site resembles the vegetative characteristics of the 10.2 ha (25.3 ac) area designated as Ponderosa Meadow in this study. Their inclusion as such on the 1975 forest cover map probably reflects the general nature of the "Cultivated, cleared" classification used to designate uses of non-forest land by the Forest Service.



Figure 4. Mule Deer Doe Browsing Saskatoon Berry in Whitworth Meadow--June, 1986.



Figure 5. Red-Osier Dogwood Recently Browsed by Deer in Whitworth Meadow--June, 1986.

If these sites, which, based on dot grid calculations, total 4.0 ha (9.9 ac), are deleted from the 1975 cover map area the revised area in 1973 would be 10.2 ha (25.3 ac). As that is identical to the area calculated for this study it would suggest that the vegetation in, and adjacent to, Ponderosa Meadow is undergoing a relatively slow rate of succession. In a general sense this is true; however, there are specific sites, not measured by the survey method utilized, where both deciduous and coniferous tree species are encroaching on the meadow. These occur primarily in the north-east and south-west quadrants of the meadow and involve poplar, trembling aspen and grand fir. Should future spring range enhancement involve removal of such pioneering species it should be done on a specimen specific basis.

Although 10 transects were surveyed in to facilitate area calculations, transects 1-A and 5-A were not used when plots were installed to determine distribution and abundance of vegetation species (Fig. 3). A total of 196 plots were installed on the remaining eight transects (Appendix 3). Thirty-nine plant genera were sufficiently abundant to warrant documenting and twenty-nine of these were identified to species (Appendix 4). As was the case in Whitworth Meadow, no comparison of changes in vegetative composition or species numbers with similar parameters occurring in the early 1970's was possible due to differences in methodology and/or study objective. In 1973 deer food preference in Ponderosa Meadow was documented based on the time deer spent eating a given species (Slaney, 1973). Sixty-one percent of the time was spent consuming shrubs of which the most commonly utilized were wild rose, snowberry, Saskatoon berry, thimbleberry and vaccinium spp.. Cottonwood and willow were the most common of the tree species selected accounting for 11 percent of the time, whereas mixed grasses and sedges accounted for 14.8 percent. A variety of forbs were selected including purple pea, lupine, dandelion, wild strawberry, yarrow, clover and tiger lily. These, plus other mixed forbs, accounted for eight per cent of plant species selected. These earlier results, in conjunction with the plant distribution and abundance data collected in this study, should enable identification of those portions of the meadow which provide the greatest forage value to deer.

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APPENDICES

APPENDIX 1. DISTRIBUTION AND RELATIVE ABUNDANCE OF VEGETATION SPECIES -
WHITWORTH MEADOW, LOWER SKAGIT VALLEY, JUNE 1986.

Tie Point #1 - intersection of trail through meadow off Ross Lake Road
and trail down to Skagit River (see Fig. 2).

Start point for all transects -- 141 m from T.P. #1 bearing 160°.

TRANSECT #1

- bearing 0° from start point.

a) Meadow (0m-116m)

<u>Plot 1</u> Red fescue...50% Yarrow.....15% Oregon grape.15% Lupine.....10% Wild rose....10%	<u>Plot 2</u> Red fescue...50% Yarrow.....25% Lupine.....25%	<u>Plot 3</u> Broad-glumed wheatgrass..50% Red fescue...20% Yarrow.....15% Lupine..... 15%	<u>Plot 4</u> Broad-glumed wheatgrass..80% Red fescue...10% Dandelion....10%
<u>Plot 5</u> Broad-glumed wheatgrass..60% Red fescue ..30% Yarrow.....10%	<u>Plot 6</u> Broad-glumed wheatgrass..65% Red fescue...20% Yarrow.....10% bare..... 5%	<u>Plot 7</u> Wild straw- berry.....50% Red fescue...25% Broad-glumed wheatgrass..10% Purple pea... 5% Yarrow..... 5% bare..... 5%	<u>Plot 8</u> Red fescue...75% Broad-glumed wheatgrass..15% Oregon grape. 5% Yarrow..... 5%
<u>Plot 9</u> Oregon grape.55% Red fescue...35% Broad-glumed wheatgrass.. 5% Yarrow..... 5%	<u>Plot 10</u> Red fescue...25% Oregon grape.20% Yarrow..... 5% bare.....50%	<u>Plot 11</u> Red fescue...45% Oregon grape. 5% Timothy..... 5% bare.....45%	<u>Plot 12</u> Red fescue...30% Yarrow..... 5% bare.....65%
<u>Plot 13</u> Yarrow.....20% Red fescue...15% Lupine.....15% Collomia..... 5% bare.....45%	<u>Plot 14</u> Red fescue...40% Lupine.....25% Yarrow..... 5% bare.....30%	<u>Plot 15</u> Red fescue...20% Broad-glumed wheatgrass.. 5% Lupine..... 5% bare.....70%	<u>Plot 16</u> Red fescue...30% Yarrow..... 5% bare.....65%
**		*Edge of road	
<u>Plot 17</u> Red fescue...50% bare.....50%	<u>Plot 18</u> Red fescue...25% Lupine.....15% Yarrow..... 5% Wild straw- berry..... 5% bare.....50%	<u>Plot 19</u> Red fescue...40% Spreading dogbane.....20% Lupine.....15% Yarrow..... 5% bare.....20%	<u>Plot 20</u> Red fescue...35% Spreading dogbane.....30% Lupine.....30% Yarrow..... 5%
** on road		*Edge of road	

Plot 21	Plot 22	Plot 23	Plot 24
Red fescue...40%	Red fescue...35%	Red fescue...70%	Red fescue...25%
Lupine.....35%	Wild straw- berry.....20%	Yarrow.....10%	Kinnikinnick.25%
Yarrow.....10%	Yarrow.....15%	Lupine..... 5%	Lupine.....10%
Wild rose.... 5%	Dandelion.... 5%	Wild straw- berry..... 5%	Yarrow..... 5%
bare.....10%	bare.....25%	Dandelion.... 5%	bare.....35%
		bare..... 5%	

b) Forest (116m)

Overstory F5B3

- fir overstory, 61-80 years old, 31-70% crown closure, 20m-29m high.

Understory

- very light density consisting of Oregon grape, kinnikinnick and wild rose.

TRANSECT #2

- bearing 45° from start point

a) Meadow (0m - 130m)

Plot 1	Plot 2	Plot 3	Plot 4
Red fescue...30%	Red fescue...95%	Red fescue...70%	Red fescue...80%
Saskatoon berry.....20%	Yarrow..... 5%	Lupine.....15%	Yarrow.....10%
Oregon grape.15%		Yarrow.....15%	Lupine.....10%
Kinnikinnick.15%			
Lupine.....10%			
Timothy..... 5%			
Yarrow..... 5%			

Plot 5	Plot 6	Plot 7	Plot 8
Red fescue...60%	Red fescue...45%	Yarrow.....40%	Red fescue...50%
Yarrow.....20%	Lupine.....30%	Red fescue...35%	Lupine.....30%
Lupine.....10%	Yarrow.....20%	Lupine.....20%	bare.....20%
Broad-glumed wheatgrass..10%	Dandelion.... 5%	Wild straw- berry..... 5%	

Plot 9	Plot 10	Plot 11	Plot 12
Lupine.....40%	Red fescue...50%	Saskatoon	Red fescue...50%
Red fescue...35%	Spreading dogbane.....20%	berry.....70%	Lupine.....20%
Saskatoon berry.....15%	Harefoot sedge.....10%	Red fescue...30%	Yarrow.....10%
bare.....10%	Yarrow..... 5%		Kinnikinnick.10%
	bare.....15%		Saskatoon
			berry..... 5%
			bare..... 5%

Plot 13
 Red fescue...70%
 Yarrow.....10%
 Wild straw-
 berry..... 5%
 Lupine..... 5%
 White
 pussytoes... 5%
 bare..... 5%

Plot 14
 Red fescue...40%
 Kinnikinnick.25%
 Yarrow..... 5%
 Wild straw-
 berry..... 5%
 Saskatoon
 berry..... 5%
 bare.....20%

Plot 15
 Red fescue...65%
 Yarrow..... 5%
 Collomia..... 5%
 Timothy..... 5%
 Muttongrass.. 5%
 Bluebunch
 wheatgrass.. 5%
 bare.....10%

Plot 16
 Bluebunch
 wheatgrass..25%
 Timothy.....20%
 Wild straw-
 berry.....20%
 Muttongrass..15%
 Redtop..... 5%
 Yarrow..... 5%
 bare.....10%

Plot 17
 Red fescue...85%
 Timothy..... 5%
 bare.....10%

Plot 18
 Red fescue...60%
 Yarrow.....20%
 Timothy..... 5%
 bare.....15%

Plot 19
 Red fescue...40%
 Oregon grape.25%
 Yarrow.....10%
 Kinnikinnick.10%
 Wild straw-
 berry..... 5%
 Timothy..... 5%
 bare..... 5%

Plot 20
 Kinnikinnick.50%
 Red fescue...35%
 Oregon grape. 5%
 Wild straw-
 berry..... 5%
 Bluebunch
 wheatgrass.. 5%

*
Plot 21
 Dandelion....15%
 Red clover... 5%
 Red fescue... 5%
 bare.....75%

* on road

*
Plot 22
 bare.....100%

* on road

Plot 23
 Red fescue...45%
 Oregon grape.40%
 Wild straw-
 berry..... 5%
 bare.....10%

Plot 24
 Red fescue...65%
 Wild straw-
 berry.....10%
 Dandelion.... 5%
 Kinnikinnick. 5%
 Lupine..... 5%
 Yarrow..... 5%
 bare..... 5%

Plot 25
 Kinnikinnick.50%
 Lupine.....20%
 Red fescue...20%
 Wild straw-
 berry..... 5%
 Timothy..... 5%

Plot 26
 Lupine.....20%
 Kinnikinnick.20%
 Red fescue...10%
 Wild straw-
 berry..... 5%
 bare.....45%

b) Meadow - Forest Ecotone (130m-195m)

Plot 27
 Kinnikinnick.85%
 Lupine.....15%

Plot 28
 Kinnikinnick.35%
 Lupine.....30%
 Red fescue...20%
 Oregon grape.10%
 Wild straw-
 berry..... 5%

Plot 29
 Lupine.....40%
 Red fescue...20%
 Kinnikinnick.15%
 Yarrow.....10%
 Saskatoon
 berry.....10%
 Red clover... 5%

Plot 30
 Lupine.....50%
 Kinnikinnick.20%
 Yarrow.....10%
 Oregon grape.10%
 Saskatoon
 berry.....10%

Plot 31
 Kinnikinnick.50%
 Lupine.....40%
 Spreading
 Dogbane..... 5%
 Wild straw-
 berry..... 5%

Plot 32
 Red twin-
 berry.....30%
 Oregon grape.30%
 Wild rose....15%
 Red fescue...15%
 Lupine.....10%

Plot 33
 Lupine.....40%
 Red fescue...20%
 White
 pussytoes...20%
 Kinnikinnick.10%
 Yarrow.....10%

Plot 34
 Lupine.....50%
 Oregon grape.20%
 Kinnikinnick.10%
 White
 pussytoes...10%
 Yarrow..... 5%
 Wild straw-
 berry..... 5%

Plot 35
 Lupine.....60%
 Kinnikinnick.25%
 Red fescue...10%
 Wild straw-
 berry..... 5%

Plot 36
 Lupine.....55%
 Kinnikinnick.20%
 Red fescue...10%
 Saskatoon
 berry.....10%
 Lodgepole
 pine..... 5%

Plot 37
 Lupine.....60%
 Kinnikinnick.25%
 Wild straw-
 berry..... 5%
 Yarrow..... 5%
 Saskatoon
 berry..... 5%

Plot 38
 Kinnikinnick.40%
 Douglas fir..25%
 Lupine.....15%
 Saskatoon
 berry.....10%
 Oregon grape.10%

Plot 39
 Lupine.....45%
 Oregon grape.15%
 Kinnikinnick.10%
 Saskatoon
 berry.....10%
 Wild rose.... 5%
 bare.....15%

Overstory F4A3

- fir overstory, 61-80 years old, 0-30% crown closure, 20m - 29m high.

Understory

- see above--plots #27 through #39.

c) Forest (195m)

Overstory F4B3

- fir overstory, 61-80 years old, 31-70% crown closure, 20m - 29m high.

Understory

- moderate density consisting of fir, lodgepole pine, Oregon grape, occasional willow and birch to 1m high.

TRANSECT #3

- bearing 90° from start point.

a) Meadow (0m-95m)

Plot 1
Red fescue...50%
Yarrow.....20%
Kinnikinnick.15%
Lupine.....10%
Red clover... 5%

Plot 2
Red fescue...35%
Lupine.....30%
Kinnikinnick.20%
Yarrow.....15%

Plot 3
Red fescue...70%
Lupine.....30%

Plot 4
Red fescue...75%
Oregon grape.10%
Lupine.....10%
Yarrow..... 5%

Plot 5
Red fescue...65%
Lupine.....35%

Plot 6
Red fescue...50%
Lupine.....35%
Saskatoon
berry.....10%
Yarrow..... 5%

Plot 7
Red fescue...50%
Lupine.....30%
Oregon grape.10%
Yarrow..... 5%
Dandelion.... 5%

Plot 8
Red fescue...60%
Oregon grape.25%
Wild rose....15%

Plot 9
Red fescue...60%
Wild straw-
berry.....15%
Yarrow.....10%
bare.....15%

Plot 10
Red fescue...70%
Wild rose....20%
bare.....10%

Plot 11
Red fescue...95%
Domestic
apple..... 5%

Plot 12
Red fescue...35%
Oregon grape.15%
bare.....50%

Plot 13
Red fescue...45%
Kinnikinnick.15%
Lupine.....15%
Yarrow.....10%
Wild rose.... 5%
Bluebunch
wheatgrass.. 5%
Oregon grape. 5%

Plot 14
Red fescue...65%
Wild straw-
berry.....15%
Oregon grape.10%
Kinnikinnick. 5%
Lupine..... 5%

Plot 15
Red fescue...40%
Oregon grape.20%
Yarrow.....15%
Wild straw-
berry.....15%
Wild rose.... 5%
Lupine..... 5%

Plot 16
Red fescue...65%
Wild straw-
berry.....10%
Kinnikinnick.10%
White
pussytoes...10%
Lupine..... 5%

Plot 17
Red fescue...40%
Lupine.....25%
Saskatoon
berry.....10%
Kinnikinnick.10%
Oregon grape. 5%
Dandelion.... 5%
Yarrow..... 5%

Plot 18
Red fescue...40%
Wild straw-
berry.....30%
Lupine.....15%
Red twin-
berry.....10%
Yarrow..... 5%

Plot 19
White
pussytoes...40%
Red fescue...25%
Wild straw-
berry.....15%
Oregon grape. 5%
Lupine..... 5%
Red twin-
berry..... 5%
Dandelion.... 5%

b) Meadow - Forest Ectone (95m-200m)

Plot 20	Plot 21	Plot 22	Plot 23
Red fescue...65%	Red fescue...60%	Red fescue...50%	Oregon grape.60%
Oregon grape.15%	Lupine.....20%	Red clover...30%	Red fescue...25%
Red clover... 5%	Dandelion....10%	Dandelion....10%	Yarrow..... 5%
Dandelion.... 5%	Wild straw- berry.....10%	Wild straw- berry.....10%	Lupine..... 5%
White pussytoes... 5%			Dandelion.... 5%
Plot 24	Plot 25	Plot 26	Plot 27
White pussytoes...35%	Red clover...30%	Red huckle- berry.....50%	Oregon grape.35%
Red fescue...25%	Red fescue...20%	Kinnikinnick.30%	Wild rose....15%
Wild straw- berry.....20%	Wild straw- berry.....20%	Oregon grape.15%	Kinnikinnick.15%
Lupine.....10%	Kinnikinnick.10%	Douglas fir.. 5%	bare.....35%
Oregon grape. 5%	Yarrow..... 5%		
Dandelion.... 5%	Oregon grape. 5%		
	Lupine..... 5%		
	Red huckle- berry..... 5%		
Plot 28			
Lupine.....30%			
Kinnikinnick.20%			
Red fescue...20%			
Oregon grape.10%			
Douglas fir.. 5%			
bare.....15%			

Overstory F5A3

- fir overstory 81-100 years old, 0-30% crown closure, 20m - 29m high.

Understory

- see above - plot #20 through to 200m***

*** plots #20 through #28 were placed to sample the under-
story; vegetation composition of understory stayed
essentially the same from plot #28 to the 200m mark,
therefore no plots were taken.

c) Forest (200m)

Overstory F5B3

- fir overstory, 81-100 years old, 31-70% crown closure, 20m - 29m high.

Understory

- light ground cover eg. Oregon grape, kinnikinnick, wild rose; also fir and lodgepole pine interspersed with birch to 1m high.

TRANSECT #4

- bearing 135° from start.*

a) Meadow (0m-85.5m)

<u>Plot 1</u> Lupine.....30% Kinnikinnick.30% Red fescue...25% Wild straw- berry..... 5% bare.....10%	<u>Plot 2</u> Lupine.....50% Kinnikinnick.30% Red fescue...10% bare.....10%	<u>Plot 3</u> Kinnikinnick.60% Red fescue...35% Lupine..... 5%	<u>Plot 4</u> Red fescue...30% Kinnikinnick.30% Lupine..... 5% bare.....35%
<u>Plot 5</u> Red fescue...40% Kinnikinnick.25% Yarrow.....10% Lupine..... 5% bare.....20%	<u>Plot 6</u> Red fescue...70% Yarrow.....20% Wild straw- berry..... 5% bare..... 5%	<u>Plot 7</u> Kinnikinnick.60% Red fescue...25% Spreading dogbane.....10% bare..... 5%	<u>Plot 8</u> Red fescue...40% Kinnikinnick.25% Oregon grape.15% Lupine.....10% Wild straw- berry..... 5% bare..... 5%
<u>Plot 9</u> Red fescue 40% Kinnikinnick.20% Purple pea...15% Lupine.....10% Red huckle- berry.....10% Wild straw- berry..... 5%	<u>Plot 10</u> Lupine.....30% Kinnikinnick.30% Red fescue...20% bare.....20%	<u>Plot 11</u> on road - no vegetation.	<u>Plot 12</u> on road - no vegetation.
<u>Plot 13</u> on road - no vegetation.	<u>Plot 14</u> Red fescue...40% Yarrow.....20% bare.....40% **centre of road	<u>Plot 15</u> Red fescue...60% Kinnikinnick.20% Lupine.....10% Wild straw- berry..... 5% White pussytoes... 5%	<u>Plot 16</u> Kinnikinnick.40% Lupine.....25% Yarrow.....20% Wild straw- berry..... 5% Red fescue... 5% White pussytoes... 5%

Plot 17
 Douglas fir..80%
 Kinnikinnick.15%
 Oregon grape. 5%

*for plots #1 through #10 plots were placed immediately north of road.

b) Forest (85.5m)

Overstory FC4A3

- Douglas fir-Western red cedar overstory, 61-80 years old, 0-30% crown closure, 20m - 29m high.

Understory

- medium to heavy density, Douglas fir, birch, mountain ash, wild rose.

TRANSECT #5

- bearing 180° from start point.

a) Meadow (0m-60m)

<p>* <u>Plot 1</u> Red fescue...50% Lupine.....50%</p>	<p>* <u>Plot 2</u> Lupine.....40% Red fescue...35% Kinnikinnick.15% Oregon grape. 5% Bluebunch wheatgrass.. 5%</p>	<p>* <u>Plot 3</u> Oregon grape.45% Red fescue...35% White pussytoes...20%</p>	<p>* <u>Plot 4</u> Red fescue...35% Broadleaf plantain....25% Yarrow.....15% Lupine.....15% bare.....10%</p>
<p>* <u>Plot 5</u> Red fescue...50% Buttercup....30% Stickweed....15% Yarrow..... 5%</p>	<p>* <u>Plot 6</u> Red fescue...30% Buttercup....30% Stickweed....15% Yarrow.....10% Red clover...10% Timothy..... 5%</p>	<p>* <u>Plot 7</u> Buttercup....40% Red fescue...25% Timothy.....10% Stickweed....10% Harefoot sedge.....10% Wild straw- berry..... 5%</p>	<p>* <u>Plot 8</u> Red fescue...40% Buttercup....30% Purple pea...10% Dandelion....10% Harefoot sedge.....10%</p>
<p>* <u>Plot 9</u> Red fescue...65% Buttercup....25% Purple pea...10%</p>	<p>* <u>Plot 10</u> Timothy.....35% Buttercup....35% Harefoot sedge.....15% Red fescue...10% Stickweed.... 5%</p>	<p>* <u>Plot 11</u> Red fescue...35% Timothy.....25% Harefoot sedge.....15% Willow sp....10% Buttercup....10% Maretail.... 5%</p>	<p>* <u>Plot 12</u> Buttercup....40% Timothy.....25% Harefoot sedge.....20% Maretail....15%</p>

*plots #1 through #5 undergo a sharp elevational decline of approximately 5m.

B) Forest (60m)

<u>Plot 13</u>	<u>Plot 14</u>
Timothy.....40%	Buttercup.....50%
Buttercup....30%	Timothy.....40%
Harefoot	Marestail....10%
sedge.....15%	
Marestail....15%	

Overstory CotD1A1

- a cottonwood-alder overstory, 1-20 years old, 0-30% crown closure, up to 10.5m high.

Understory

- see above--plots #13 and #14. Also willow species, red-osier dogwood. Area is poorly drained.

TRANSECT #6

- bearing 225° from start point.

a) Meadow (0m-75m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4</u>
Kinnikinnick.45%	Red fescue...30%	Red fescue...75%	Purple pea...40%
Lupine.....25%	Kinnikinnick.20%	Lupine.....15%	Red fescue...30%
Red fescue...15%	Lupine.....20%	Dandelion.... 5%	Yarrow.....15%
Bluebunch	Bluebunch	Yarrow..... 5%	Saskatoon
wheatgrass.. 5%	wheatgrass..15%		berry.....10%
bare.....10%	bare.....15%		Buttercup.... 5%
<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u>	<u>Plot 8</u>
Buttercup....40%	Buttercup....50%	Buttercup....45%	Buttercup....50%
Red clover...20%	Red clover...25%	Timothy.....25%	Timothy.....20%
Red fescue...20%	Red fescue...20%	Dandelion....10%	Stickweed....10%
Purple pea...20%	Harefoot	Red fescue...10%	Red fescue...10%
	sedge..... 5%	Red clover... 5%	Harefoot
		Harefoot	sedge.....10%
		sedge..... 5%	
<u>Plot 9</u>	<u>Plot 10</u>	<u>Plot 11</u>	<u>Plot 12</u>
Buttercup....50%	Buttercup....50%	Buttercup....45%	Stickweed....30%
Timothy.....25%	Timothy.....15%	Stickweed....30%	Sedge sp.....30%
Harefoot	Harefoot	Timothy.....10%	Harefoot
sedge.....10%	sedge.....15%	Red fescue...10%	sedge.....15%
Dandelion....10%	Stickweed....15%	Harefoot	Timothy.....15%
Red fescue... 5%	Purple pea... 5%	sedge..... 5%	Purple pea... 5%
			Red fescue... 5%

Plot 13	Plot 14	Plot 15
Stickweed....35%	Broad-glumed	Red fescue...40%
Timothy.....30%	wheatgrass..35%	Buttercup....20%
Harefoot	Red fescue...25%	Harefoot
sedge.....20%	Sedge sp.....25%	sedge.....15%
Dandelion....15%	Stickweed....10%	Yarrow.....10%
	Buttercup.... 5%	Thistle..... 5%
		Dandelion.... 5%
		Red clover... 5%

*plots 1 through 4 are representative of the vegetation above and on the cutbank; plots 5 through 15 are representative of the less rigorously drained bottomland.

b) Meadow-Forest Ecotone (75m-170m)

Plot 16	Plot 17	Plot 18	Plot 19
Red fescue...55%	Harefoot	Douglas	Red fescue...55%
Stickweed....15%	sedge.....35%	spirea.....40%	Douglas
Timothy.....10%	Yarrow.....15%	Red fescue...30%	spirea.....30%
Harefoot	Thistle.....15%	Yarrow.....10%	Thistle.....10%
sedge.....10%	Red fescue...15%	Thistle.....10%	Buttercup.... 5%
Buttercup....10%	Buttercup....10%	Buttercup.... 5%	
	Dandelion.... 5%	Red clover... 5%	
	Timothy..... 5%		

Plot 20	Plot 21	Plot 22	Plot 23
Douglas	Douglas	Red fescue...35%	Wild rose...100%
spirea.....55%	spirea.....55%	Douglas	
Red fescue...30%	Red fescue...25%	spirea.....25%	
Thistle..... 5%	Stickweed....10%	Wild rose....20%	
Buttercup.... 5%	Thistle..... 5%	Buttercup....10%	
Timothy..... 5%	Buttercup.... 5%	Thistle.....10%	

Plot 24	Plot 25	Plot 26	Plot 27
Wild rose....85%	Wild rose....70%	Douglas	Douglas
Douglas	Douglas	spirea.....50%	spirea.....50%
spirea.....15%	spirea.....20%	Wild rose....35%	Wild rose....50%
	Red-osier	Red-osier	
	dogwood....10%	dogwood....15%	

Plot 28	Plot 29	Plot 30	Plot 31
Douglas	Douglas	Douglas	Douglas
spirea.....100%	spirea.....75%	spirea.....50%	spirea.....25%
	Wild rose....25%	Wild rose....50%	Red fescue...25%
			Yarrow.....15%
			Thistle.....15%
			Purple pea...10%
			Wild rose.... 5%
			Timothy..... 5%

<u>Plot 32</u>	<u>Plot 33</u>	<u>Plot 34</u>
Red fescue...40%	Wild rose....25%	Thimble- berry.....40%
Wild rose....20%	Douglas spirea.....25%	Thistle.....20%
Douglas spirea.....15%	Stickweed....15%	Harefoot sedge.....20%
Thistle.....10%	Thistle.....15%	Douglas spirea.....10%
Bracken fern 10%	Yarrow.....15%	Wild rose....10%
Purple pea... 5%	Bracken fern. 5%	

c) Forest (170m)

Overstory CotD2B2

- cottonwood-alder overstory, 1 to 10 years old, 31-70% crown closure, 11m-20m high.

Understory

- medium density consisting primarily of bracken fern, thistle, thimbleberry, bearded fescue.

TRANSECT #7

- bearing 270° from start point.

a) Meadow (0m-130m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4*</u>
Red fescue...55%	Lupine.....50%	Lupine.....50%	Oregon grape.30%
Lupine.....40%	Red fescue...35%	Red fescue...40%	Duff.....70%
bare..... 5%	Kinnikinnick.15%	Oregon grape. 5%	
		Bluebunch wheatgrass.. 5%	*under fir tree

<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u>	<u>Plot 8</u>
Red fescue...35%	Red fescue...50%	Red fescue...85%	Red fescue...25%
Oregon grape.30%	Timothy.....15%	Yarrow.....15%	Lupine.....15%
Lupine.....15%	Lupine.....15%		Sheep sorrel. 5%
Wild straw- berry.....10%	Purple pea...10%		bare.....55%
Yarrow..... 5%	Dandelion.... 5%		
bare..... 5%	Yarrow..... 5%		

<u>Plot 9</u>	<u>Plot10</u>	<u>Plot 11</u>	<u>Plot 12</u>
Buttercup....80%	Buttercup....65%	Red fescue...55%	Red fescue...40%
Red clover...10%	Red fescue...15%	Harefoot sedge.....20%	Buttercup....40%
Red fescue...10%	Timothy.....10%	Douglas spirea.....15%	Harefoot sedge.....20%
	Harefoot sedge.....10%	Buttercup....10%	

Plot 13
 Dandelion....50%
 Buttercup....30%
 Harefoot
 sedge.....20%

Plot 14
 Buttercup....50%
 Red fescue...25%
 Dandelion....15%
 Red clover... 5%
 Stickweed.... 5%

Plot 15
 Red fescue...30%
 Buttercup....30%
 Timothy.....20%
 Wild rose....10%
 Dandelion....10%

Plot 16
 Buttercup....35%
 Timothy.....30%
 Wild rose....10%
 Red fescue...10%
 White clover.10%
 Harefoot
 sedge..... 5%

Plot 17
 Timothy.....80%
 Dandelion....10%
 Buttercup.... 5%
 Red fescue... 5%

Plot 18
 Timothy.....50%
 Red fescue...35%
 Harefoot
 sedge.....10%
 Dandelion.... 5%

Plot 19
 Timothy.....45%
 Red fescue...20%
 Harefoot
 sedge.....15%
 Buttercup....10%
 White
 clover..... 5%
 Yarrow..... 5%

Plot 20
 Red fescue...35%
 Purple pea...25%
 Willow sp....20%
 Stickweed....15%
 Thistle..... 5%

Plot 21
 Red fescue...35%
 Purple pea...25%
 Stickweed....20%
 Harefoot
 sedge.....10%
 Thistle.....10%

Plot 22
 Bracken fern.30%
 Stickweed....20%
 Thimble-
 berry.....20%
 Red fescue...20%
 Purple pea... 5%
 Yarrow..... 5%

Plot 23
 Red fescue...60%
 Stickweed....10%
 Buttercup....10%
 Thimble-
 berry.....10%
 Yarrow.....10%

Plot 24
 Red fescue...70%
 Stickweed....20%
 Yarrow.....10%

Plot 25
 Thimble-
 berry.....40%
 Red fescue...35%
 Bracken fern.15%
 Timothy..... 5%
 Stickweed.... 5%

Plot 26
 Bearded
 fescue.....40%
 Thimble-
 berry.....30%
 Bracken fern.20%
 Stickweed....10%

** plot on cut-trail to recently installed manhole

*** plots #9 through #26 are representative of the vegetation below the cutbank.

b) Forest (130m)

Overstory DFC3C2

- alder-fir-cedar overstory, 41-60 years old, 71-100% crown closure, 11m-29m high.

Understory

- light density consisting of thimbleberry, bearded fescue, red-osier dogwood.

TRANSECT #8

- bearing 315° from start point (runs parallel to cutbank).

a) Meadow (0m-145m)

* Plot 1	* Plot 2	* Plot 3	* Plot 4
Red fescue...40%	Red fescue...40%	Red fescue...45%	Red fescue...30%
Lupine.....30%	Kinnikinnick.25%	Lupine.....20%	Lupine.....25%
Yarrow.....10%	Lupine..... 5%	Yarrow.....10%	Yarrow.....20%
Wild straw- berry..... 5%	Yarrow..... 5%	Dandelion.... 5%	Wild straw- berry..... 5%
Sheep sorrel. 5%	Bluebunch	bare.....20%	bare.....20%
bare.....10%	wheatgrass.. 5%		
	bare.....20%		

*adjacent to road

*adjacent to road

*adjacent to road

	* Plot 6		** Plot 8
Plot 5 on road - no vegetation	Red fescue...15%	Plot 7 on road - no vegetation	Red fescue...25%
	Dandelion....10%		Lupine.....15%
	Yarrow..... 5%		Yarrow.....10%
	bare.....70%		bare.....50%

*centre of road

** Plot 9			* Plot 12
Red fescue...40%	Plot 10 on road - no vegetation	Plot 11 on road - no vegetation	Red fescue...10%
Lupine.....40%			Yarrow..... 5%
bare.....20%			Wild straw- berry..... 5%
			bare.....80%

*edge of road

Plot 13	Plot 14	Plot 15	Plot 16
Red fescue...50%	Red fescue...40%	Red fescue...50%	Red fescue...70%
bare.....50%	bare.....60%	bare.....50%	Lupine..... 5%
			bare.....25%

		*** Plot 19	Plot 20
Plot 17	Plot 18	Sheep sorrel.20%	Red fescue...40%
Red fescue...45%	Red fescue...40%	Red fescue...10%	Oregon grape.25%
Wild straw- berry.....15%	Lupine.....20%	Lupine..... 5%	Wild straw- berry.....15%
bare.....40%	Yarrow..... 5%	Yarrow..... 5%	Yarrow.....10%
	bare.....35%	bare.....60%	bare.....10%

Plot 21	Plot 22	Plot 23	Plot 24
Red fescue...70%	Red fescue...25%	Red fescue...65%	Red fescue...20%
Lupine.....25%	Lupine.....10%	Lupine.....20%	Lupine..... 5%
Wild straw- berry..... 5%	Sheep sorrel. 5%	Wild rose....15%	bare.....75%
	bare.....60%		

Plot 25	Plot 26	Plot 27	Plot 28
Red fescue...60%	Red fescue...60%	Red fescue...65%	Lupine.....50%
Lupine.....20%	Wild straw- berry.....10%	Oregon grape.25%	Wild straw- berry.....30%
Yarrow..... 5%	Yarrow..... 5%	Wild straw- berry..... 5%	bare.....20%
Wild straw- berry..... 5%	bare.....25%	Lupine..... 5%	
bare.....10%			

Plot 29
Kinnikinnick.30%
Wild straw- berry.....20%
Lupine.....20%
Red fescue... 5%
bare.....25%

** disturbed area - road to manhole

*** highly disturbed area

b) Forest (145m)

Plot 30	Plot 31	Plot 32	Plot 33
Red fescue...35%	Oregon grape.40%	Kinnikinnick.30%	Oregon grape.40%
Kinnikinnick.35%	Lupine.....40%	Saskatoon	Boxwood.....20%
Lupine.....25%	Red fescue...20%	berry.....20%	Saskatoon
Oregon grape. 5%		Lupine.....15%	berry.....10%
		Red fescue...10%	Lupine..... 5%
		bare.....25%	bare.....25%

Overstory F3B3

- fir overstory, 81 to 100 years old, 31-70% crown closure, 20m-29m high.

Understory

- see above - plots #30 through #33.

APPENDIX 2 VEGETATION LIST OF PLANT SPECIES COMMONLY OCCURRING IN STUDY PLOTS - WHITWORTH MEADOWS, LOWER SKAGIT VALLEY, JUNE 1986.

	<u>Common Name</u>	<u>Scientific Name</u>
<u>Trees</u>	Douglas fir	<u>Pseudotsuga menziesii</u>
	Lodgepole pine	<u>Pinus contorta latifolia</u>
	Western white birch	<u>Betula papyrifera communtata</u>
	Western red cedar	<u>Thuja plicata</u>
	Northern black cottonwood	<u>Populus trichocarpa</u>
	Red alder	<u>Alnus rubra</u>
<u>Shrubs</u>	Western wild rose	<u>Rosa woodsii var. ultramontana</u>
	Saskatoon berry	<u>Amelanchier alnifolia</u>
	Spreading dogbane	<u>Apocynum androsaemifolium</u>
	Oregon grape	<u>Berberis nervosa</u>
	Red twinberry	<u>Lonicera utahensis</u>
	Red huckleberry	<u>Vaccinium parvifolium</u>
	Douglas spirea	<u>Douglas spirea</u>
	Red-osier dogwood	<u>Cornus occidentalis</u>
	Thimbleberry	<u>Rubus parviflora</u>
	Willow	<u>Salix spp.</u>
	False box	<u>Pachistima myrsinites</u>
	Sitka mountain ash	<u>Sorbus sitchensis</u>
<u>Forbs/Flowers</u>	Yarrow	<u>Achillea millefolium</u>
	Lupine	<u>Lupinus spp.</u>
	Purple pea	<u>Lathyrus nevadensis</u>
	Collomia	<u>Collomia grandiflora</u>
	Wild strawberry	<u>Fragaria vesca var. crinita</u>
	Kinnikinnick	<u>Arctostaphylos Uva-ursi</u>
	Dandelion	<u>Taraxacum spp.</u>
	White pussytoes	<u>Antennaria neglecta</u>
	Broadleaf plantain	<u>Plantago major</u>
	Buttercup	<u>Ranunculus spp.</u>
	Stickweed	<u>Hackelai floribunda</u>
	Thistle	<u>Cirsium spp.</u>
	Bracken fern	<u>Pteridium aquilinum pubescens</u>
	Sheep sorrel	<u>Rumex acetosella</u>
	Red clover	<u>Trifolium pratense</u>
	Marestail	<u>Hippuris vulgaris</u>
<u>Grasses/Sedges</u>	Red fescue	<u>Festuca rubra</u>
	Broad-glumed wheatgrass	<u>Agropyron violaceum</u>
	Harefoot sedge	<u>Carex leporina</u>
	Muttongrass	<u>Poa fendleriana</u>
	Timothy	<u>Phleum pratense</u>
	Red top	<u>Agostis stolonifera</u>
	Bluebunch wheatgrass	<u>Agropyron spicatum</u>
	Bearded fescue	<u>Festuca subulata</u>

APPENDIX 3. Distribution and Relative Abundance of Vegetation Species
- Ponderosa Meadow, Lower Skagit Valley, June 1986.

Tie Point #1 - intersection at south end of the meadow of trails running north-south and east-west (see Fig. 3).

Start Point for all transects -- 210m from T.P. #1 bearing 10°.

TRANSECT #1

a) Meadow (0m-170m)

- bearing 0° from start point.

Plot 1
Kentucky
bluegrass...45%
Cinquefoil...30%
Harefoot
sedge.....15%
Wild rose.... 5%
Lupine..... 5%

Plot 2
Kentucky
bluegrass...55%
Cinquefoil...15%
Wild straw-
berry.....15%
Western
needlegrass.10%
Lupine..... 5%

Plot 3
Harefoot
sedge.....70%
Kentucky
bluegrass...20%
Lupine..... 5%
Yarrow..... 5%

Plot 4
Kentucky
bluegrass...40%
Lupine.....35%
Wild rose....15%
Cinquefoil... 5%
Harefoot
sedge..... 5%

Plot 5
Kentucky
bluegrass...50%
Wild rose....35%
Lupine.....15%

Plot 6
Wild rose....50%
Timothy.....20%
Fireweed.....15%
Harefoot
sedge.....10%
Kentucky
bluegrass... 5%

Plot 7
on road - no
vegetation

Plot 8
Wild rose....35%
Kentucky
bluegrass...20%
Lupine.....20%
Timothy.....15%
Oregon grape. 5%
Waxberry..... 5%

* edge of road

* edge of road

Plot 9
Lupine.....30%
Wild rose....15%
Waxberry.....15%
Kentucky
bluegrass...15%
Harefoot
sedge.....15%
Oregon grape.10%

Plot 10
Wild rose....40%
Kentucky
bluegrass...25%
Oregon grape.20%
Waxberry.....15%

Plot 11
Kentucky
bluegrass...75%
Oregon grape.15%
Yarrow.....10%

Plot 12
Kentucky
bluegrass...25%
Lupine.....20%
Yarrow.....15%
Waxberry.....15%
Harefoot
sedge.....10%
Wild rose....10%
Timothy..... 5%

Plot 13
 Wild rose....20%
 Lupine.....20%
 Western
 needlegrass.15%
 Waxberry.....10%
 Harefoot
 sedge.....10%
 Timothy.....10%
 Cinquefoil...10%
 Yarrow..... 5%

Plot 14
 Wild rose....50%
 Lupine.....15%
 Timothy.....15%
 Harefoot
 sedge.....10%
 Yarrow..... 5%
 Cinquefoil... 5%

Plot 15
 Wild rose....40%
 Waxberry.....40%
 Harefoot
 sedge.....15%
 Kentucky
 bluegrass... 5%

Plot 16
 Wild rose....35%
 Waxberry.....35%
 Harefoot
 sedge.....15%
 Cinquefoil...10%
 Timothy..... 5%

Plot 17
 Waxberry.....40%
 Lupine.....25%
 Wild rose....10%
 Yarrow.....10%
 Oregon grape. 5%
 Harefoot
 sedge..... 5%
 Kentucky
 bluegrass... 5%

Plot 18
 Lupine.....25%
 Wild rose....20%
 Waxberry.....15%
 Timothy.....10%
 Oregon grape.10%
 Harefoot
 sedge.....10%
 Cinquefoil... 5%
 Kentucky
 bluegrass... 5%

Plot 19
 Lupine.....30%
 Wild rose....25%
 Waxberry.....20%
 Oregon grape.15%
 Timothy..... 5%
 Kentucky
 bluegrass... 5%

Plot 20
 Oregon grape.25%
 Wild rose....20%
 Waxberry.....20%
 Fireweed.....15%
 Yarrow.....10%
 Lupine.....10%

Plot 21
 Lupine.....30%
 Wild rose....20%
 Waxberry.....20%
 Oregon grape.20%
 Timothy..... 5%
 Kentucky
 bluegrass... 5%

Plot 22
 Harefoot
 sedge.....40%
 Wild rose....25%
 Waxberry.....25%
 Timothy..... 5%
 Oregon grape. 5%

Plot 23
 Waxberry.....30%
 Wild rose....30%
 Harefoot
 sedge.....30%
 Oregon grape.10%

Plot 24
 Oregon grape.40%
 Wild rose....30%
 Waxberry.....15%
 Harefoot
 sedge.....10%
 Timothy..... 5%

Plot 25
 Wild rose....35%
 Waxberry.....25%
 Oregon grape.15%
 Kentucky
 bluegrass...10%
 California
 brome.....10%
 Wild straw-
 berry..... 5%

Plot 26
 Wild rose....40%
 Waxberry.....20%
 Lupine.....20%
 Harefoot
 sedge.....10%
 Oregon grape. 5%
 Timothy..... 5%

Plot 27
 Waxberry.....45%
 Wild rose....25%
 Harefoot
 sedge.....10%
 Lupine..... 5%
 Timothy..... 5%
 Fireweed..... 5%
 Kentucky
 bluegrass... 5%

Plot 28
 Wild rose....40%
 Oregon grape.30%
 Harefoot
 sedge.....20%
 Fireweed..... 5%
 Timothy..... 5%

Plot 29
 Wild rose....20%
 Lupine.....20%
 Oregon grape.20%
 Waxberry.....20%
 Harefoot
 sedge.....15%
 Timothy..... 5%

Plot 30
 Wild rose....35%
 Waxberry.....25%
 Harefoot
 sedge.....15%
 Kentucky
 bluegrass...15%
 Yarrow.....10%

Plot 31
 Wild rose....40%
 Oregon grape.30%
 Waxberry.....20%
 Kentucky
 bluegrass...10%

Plot 32
 Wild rose....50%
 Oregon grape.20%
 Waxberry.....15%
 Harefoot
 sedge.....10%
 Kentucky
 bluegrass... 5%

<u>Plot 33</u>	<u>Plot 34</u>
Wild rose....25%	Wild rose....30%
Oregon grape.25%	Waxberry.....30%
Waxberry.....15%	Fireweed.....10%
California	Timothy.....10%
brome.....15%	Harefoot
Kentucky	sedge.....10%
bluegrass... 5%	Oregon grape.10%
Harefoot	
sedge..... 5%	
Lupine..... 5%	
Yarrow..... 5%	

b) Meadow-Forest Ecotone (170m-190m)

<u>Plot 35</u>	<u>Plot 36</u>	<u>Plot 37</u>	<u>Plot 38</u>
Wild rose....40%	Wild rose....80%	Wild rose....70%	Thimble
Oregon grape.30%	Oregon grape.20%	Waxberry.....15%	berry.....35%
Waxberry.....15%		Oregon grape.15%	Wild rose....35%
Lupine.....10%			Oregon grape.30%
Timothy..... 5%			

Overstory BF1A1

- grand and Douglas fir overstory, 1-20 years old, 0-30% crown closure, up to 7m high.

Understory

- see above - plots #35 through #38. Also present were willow to 3m high and Saskatoon berry.

c) Forest (190m)

Overstory FB4C3

- Douglas and grand fir overstory, 61-80 years old, 71-100% crown closure, 20m-29m high.

Understory

- sparse to medium density consisting of primarily Oregon grape, thimbleberry and Saskatoon berry, interspersed with maple and willow to 5m high.

TRANSECT #2

- bearing 45° from start point.

a) Meadow (0m-101m)

Plot 1
Harefoot
sedge.....35%
Cinquefoil...25%
Wild rose....10%
Kentucky
bluegrass...10%
Yarrow..... 5%
Dandelion.... 5%
Waxberry..... 5%
Oyster plant. 5%

Plot 2
Lupine.....25%
Kentucky
bluegrass...20%
Harefoot
sedge.....20%
Waxberry.....20%
Purple pea... 5%
Yarrow..... 5%
Fireweed..... 5%

Plot 3
Lupine.....20%
Oregon grape.15%
Cinquefoil...15%
Harefoot
sedge.....15%
Waxberry.....15%
Kentucky
bluegrass...10%
Cinquefoil...10%

Plot 4
Waxberry.....50%
Harefoot
sedge.....30%
Lupine.....10%
Cinquefoil... 5%
Kentucky
bluegrass... 5%

Plot 5
Waxberry.....30%
Harefoot
sedge.....25%
Timothy.....15%
Wild rose....10%
Yarrow.....10%
Kentucky
bluegrass...10%

Plot 6
Kentucky
bluegrass...25%
Harefoot
sedge.....25%
Cinquefoil...20%
Lupine.....10%
Yarrow.....10%
Wild rose.... 5%
Western
needlegrass. 5%

Plot 7
Kentucky
bluegrass...45%
Lupine.....25%
Yarrow.....15%
Wild rose....10%
Oyster plant. 5%

Plot 8
Kentucky
bluegrass...30%
Harefoot
sedge.....30%
Wild rose....25%
Yarrow.....15%

Plot 9
Wild rose....25%
Waxberry.....25%
Kentucky
bluegrass...20%
Harefoot
sedge.....15%
Yarrow.....10%
Oyster plant. 5%

Plot 10
Kentucky
bluegrass...20%
Harefoot
sedge.....20%
Waxberry.....15%
Western
needlegrass.15%
Yarrow.....15%
Cinquefoil...10%
Dandelion.... 5%

Plot 11
Kentucky
bluegrass...45%
Wild rose....25%
Yarrow.....10%
Harefoot
sedge.....10%
Timothy..... 5%
Waxberry..... 5%

Plot 12
Lupine.....35%
Yarrow.....20%
Waxberry.....20%
Western
needlegrass.15%
Kentucky
bluegrass...10%

Plot 13
Waxberry.....25%
Lupine.....25%
Harefoot
sedge.....25%
Yarrow.....15%
Kentucky
bluegrass...10%

Plot 14
Waxberry.....50%
Timothy.....10%
Kentucky
bluegrass...10%
Yarrow.....10%
Dandelion....10%
Purple pea... 5%
Western
needlegrass. 5%

Plot 15
Waxberry.....85%
Kentucky
bluegrass...15%

Plot 16
Waxberry.....40%
Yarrow.....15%
California
brome.....15%
Wild rose....15%
Harefoot
sedge.....10%
Fireweed..... 5%

Plot 17
Oregon grape.30%
Wild rose....20%
Lupine.....20%
Waxberry.....20%
California
brome..... 5%
Kentucky
bluegrass... 5%

Plot 18
Wild rose....30%
Oregon grape.20%
Lupine.....15%
Waxberry.....15%
Kentucky
bluegrass...10%
Saskatoon
berry.....10%

Plot 19
Waxberry.....35%
Wild rose....30%
Grand fir....15%
Oregon grape.10%
Kentucky
bluegrass... 5%
Saskatoon
berry..... 5%

Plot 20
Lupine.....30%
Waxberry.....30%
Oregon grape.10%
Kentucky
bluegrass...10%
Timothy.....10%
Yarrow..... 5%
Wild straw-
berry..... 5%

b) Forest (101m)

Overstory FB4B3

- grand and Douglas fir overstory, 61-80 years old, 31-70% crown closure, 20m-29m high.

Understory

- ground cover under the fir very sparse; right at the meadow-forest interface is a very narrow zone consisting of maple, Saskatoon berry, willow, elderberry, Oregon grape, wild rose and aspen. Tree species vary in height to 7m high.

TRANSECT 3

- bearing 90° from start point.

a) Meadow (0m-50m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4</u>
Lupine.....45%	Timothy.....30%	Cinquefoil...45%	Cinquefoil...25%
Harefoot	Harefoot	Harefoot	Lupine.....15%
sedge.....20%	sedge.....30%	sedge.....15%	Kentucky
Cinquefoil...15%	Cinquefoil...20%	Yarrow.....15%	bluegrass...15%
Yarrow.....15%	Lupine.....10%	Timothy.....15%	Yarrow.....15%
Kentucky	Yarrow.....10%	Kentucky	Wild rose....15%
bluegrass... 5%		bluegrass...10%	Harefoot
			sedge.....15%
<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u>	<u>Plot 8</u>
Waxberry.....25%	Lupine.....25%	Wild rose....50%	Waxberry.....45%
Cinquefoil...25%	Wild rose....20%	Waxberry.....25%	Wild rose....25%
Wild rose....15%	Waxberry.....20%	Harefoot	Yarrow.....10%
Kentucky	Kentucky	sedge.....20%	Kentucky
bluegrass...10%	bluegrass...15%	Kentucky	bluegrass... 5%
Western	Harefoot	bluegrass... 5%	Harefoot
needlegrass.10%	sedge.....10%		sedge..... 5%
Harefoot	Yarrow..... 5%		Western
sedge.....10%	Timothy..... 5%		needlegrass. 5%
Cinquefoil... 5%			Dandelion.... 5%
<u>Plot 9</u>	<u>Plot 10</u>		
Wild rose....85%	Wild rose....40%		
Waxberry.....15%	Waxberry.....40%		
	California		
	brome.....20%		

b) Forest (50m)

Plot 11

Waxberry.....35%
Wild rose.....50%
Red-osier
dogwood.....10%
California
brome..... 5%

Overstory FB4B4

- Douglas and grand fir overstory, 61-80 years old, 31-70% crown closure, 29m-43m high.

Understory

- see above - plot #11. In addition includes maple, small fir spp. and Saskatoon berry. Ground cover is sparse, consisting primarily of trillium, small rose and small maple.

TRANSECT 4

- bearing 135° from start point.

a) Meadow (0m-125m)

Plot 1

Harefoot
sedge.....30%
Lupine.....25%
Timothy.....15%
Yarrow.....10%
Wild rose.....10%
Kentucky
bluegrass...10%

Plot 2

Timothy.....15%
Cinquefoil...15%
Harefoot
sedge.....15%
Yarrow.....15%
Pyramidal
spirea.....15%
Kentucky
bluegrass...15%
Purple pea...10%

Plot 3

Wild rose....20%
Waxberry.....20%
Lupine.....15%
Cinquefoil...15%
Harefoot
sedge.....15%
Yarrow.....10%
Kentucky
bluegrass... 5%

Plot 4

Wild rose....20%
Yarrow.....15%
Waxberry.....15%
Timothy.....10%
Harefoot
sedge.....10%
Cinquefoil...10%
Kentucky
bluegrass... 5%
log.....15%

Plot 5

Wild rose....30%
Cinquefoil...20%
Saskatoon
berry.....15%
Lupine.....15%
Purple pea... 5%
Timothy..... 5%
Kentucky
bluegrass... 5%
Harefoot
sedge..... 5%

Plot 6

Lupine.....35%
Wild rose....20%
Timothy.....20%
Kentucky
bluegrass...10%
Harefoot
sedge.....10%
Dandelion.... 5%

Plot 7

Wild rose....25%
Cinquefoil...20%
Waxberry.....20%
Timothy.....15%
Lupine.....10%
Yarrow..... 5%
California
brome..... 5%

Plot 8

Saskatoon
berry.....30%
Wild rose....25%
Timothy.....15%
Waxberry.....10%
Harefoot
sedge.....10%
Kentucky
bluegrass... 5%
Yarrow..... 5%

Plot 9
 Timothy.....25%
 Kentucky
 bluegrass...20%
 Yarrow.....10%
 Wild rose....10%
 Red-osier
 dogwood.....10%
 Western
 needlegrass.10%
 Waxberry.....10%
 Lupine..... 5%

Plot 10
 Wild rose....50%
 Waxberry.....25%
 Western
 needlegrass.10%
 Timothy..... 5%
 Lupine..... 5%
 Yarrow..... 5%

Plot 11
 Oregon grape.60%
 Grand fir....20%
 Timothy.....10%
 Wild rose....10%

Plot 12
 Grand fir....60%
 Oregon grape.30%
 Wild rose....10%

Plot 13
 Waxberry.....45%
 Grand fir....30%
 Oregon grape.15%
 Saskatoon
 berry.....10%

Plot 14
 Unidentified
 forbs.....50%
 Oregon grape.25%
 California
 brome.....15%
 Lupine.....10%

Plot 15
 Waxberry.....45%
 Oregon grape.25%
 Kentucky
 bluegrass...15%
 California
 brome..... 5%
 Lupine..... 5%
 Timothy..... 5%

Plot 16
 Lupine.....35%
 Oregon grape.30%
 Waxberry.....25%
 Wild rose.... 5%
 Timothy..... 5%

Plot 17
 Oregon grape.30%
 Wild rose....25%
 Waxberry.....20%
 Lupine.....15%
 Cinquefoil... 5%
 Kentucky
 bluegrass... 5%

Plot 18
 Wild rose....20%
 Oregon grape.20%
 Waxberry.....15%
 Lupine.....25%
 Yarrow.....10%
 Harefoot
 sedge..... 5%
 Kentucky
 bluegrass... 5%

Plot 19
 Oregon grape.75%
 Wild rose....15%
 Waxberry..... 5%
 Timothy..... 5%

Plot 20
 under "island"
 of young fir -
 no vegetative
 understory.

Plot 21
 Oregon grape.45%
 Waxberry.....25%
 Lupine.....20%
 Timothy..... 5%
 Saskatoon
 berry..... 5%

Plot 22
 Oregon grape.70%
 Wild rose....15%
 Waxberry.....15%

Plot 23
 Oregon grape.65%
 Waxberry.....20%
 Wild rose....10%
 Purple pea... 5%

Plot 24
 Oregon grape.60%
 Wild rose....20%
 Waxberry.....10%
 Timothy..... 5%
 California
 brome..... 5%

Plot 25
 Wild rose....50%
 Oregon grape.35%
 Timothy.....10%
 Waxberry..... 5%

b) Meadow-Forest Ecotone (125m-145.8m)

<u>Plot 26</u>	<u>Plot 27</u>	<u>Plot 28</u>	<u>Plot 29</u>
Oregon grape.30%	Fir.....75%	Fir.....75%	Bracken fern.50%
Fir.....20%	Wild rose....25%	Waxberry.....20%	Waxberry.....25%
Wild rose....20%		California	Oregon grape.15%
Waxberry.....20%		brome..... 5%	Thimble-
California			berry.....10%
brome.....10%			

c) Forest (145.8m)

Overstory BF4B3

- grand and Douglas fir overstory, 61-80 years old, 31-70% crown closure, 20m-29m high.

Understory

- medium density of maple, small fir and Saskatoon berry.

TRANSECT #5

- bearing 180° from start point.

a) Meadow (0m-215m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4</u>
Harefoot	Pyramidal	Pyramidal	Waxberry.....40%
sedge.....25%	spirea.....35%	spirea.....30%	Pyramidal
Lupine.....25%	Harefoot	Timothy.....30%	spirea.....25%
Kentucky	sedge.....20%	Harefoot	Timothy.....10%
bluegrass...20%	Cinquefoil...20%	sedge.....25%	Western
Cinquefoil...20%	Kentucky	Western	needlegrass.10%
Wild rose.... 5%	bluegrass...10%	needlegrass.10%	Yarrow..... 5%
Yarrow..... 5%	Yarrow.....10%	Purple pea... 5%	Harefoot
	Lupine..... 5%		sedge..... 5%
			Cinquefoil... 5%
<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u>	<u>Plot 8</u>
Cinquefoil...30%	Pyramidal	Lupine.....25%	Lupine.....30%
Pyramidal	spirea.....20%	California	Pyramidal
spirea.....15%	California	brome.....20%	spirea.....15%
Yarrow.....15%	brome.....20%	Pyramidal	Harefoot
Purple pea...10%	Harefoot	spirea.....20%	sedge.....15%
Harefoot	sedge.....20%	Wild rose....15%	Yarrow.....15%
sedge.....10%	Wild rose....15%	Timothy.....10%	Wild rose....15%
Lupine..... 5%	Western	Kentucky	Kentucky
Timothy..... 5%	needlegrass.10%	bluegrass... 5%	bluegrass...10%
Kentucky	Waxberry.....10%	Purple pea... 5%	
bluegrass... 5%	Timothy..... 5%		
Waxberry..... 5%			

Plot 9
 Lupine.....30%
 Pyramidal
 spirea.....25%
 Timothy.....15%
 Yarrow.....10%
 Kentucky
 bluegrass...10%
 Cinquefoil... 5%
 California
 brome..... 5%

Plot 10
 Waxberry.....20%
 Lupine.....20%
 Harefoot
 sedge.....20%
 Wild rose....15%
 Timothy.....10%
 Cinquefoil... 5%
 California
 brome..... 5%
 Yarrow..... 5%

Plot 11
 Kentucky
 bluegrass...55%
 Lupine.....20%
 Wild rose....15%
 Harefoot
 sedge..... 5%
 Oyster plant. 5%

Plot 12
 Timothy.....20%
 Kentucky
 bluegrass...20%
 Wild rose....15%
 Yarrow.....15%
 Western
 needlegrass.15%
 Lupine.....10%
 Harefoot
 sedge..... 5%

Plot 13
 Lupine.....25%
 Kentucky
 bluegrass...25%
 Timothy.....20%
 Wild rose....10%
 Yarrow.....10%
 Harefoot
 sedge.....10%

Plot 14
 Timothy.....20%
 Wild rose....20%
 Lupine.....15%
 Yarrow.....15%
 Saskatoon
 berry.....10%
 Cinquefoil...10%
 Kentucky
 bluegrass...10%

Plot 15
 Wild rose....30%
 Lupine.....20%
 Timothy.....15%
 Harefoot
 sedge.....10%
 Kentucky
 bluegrass...10%
 Yarrow..... 5%
 Dandelion.... 5%
 Western
 needlegrass. 5%

Plot 16
 Timothy.....20%
 Pyramidal
 spirea.....15%
 Waxberry.....15%
 Wild rose....15%
 Harefoot
 sedge.....15%
 Kentucky
 bluegrass...15%
 Dandelion.... 5%

Plot 17
 Timothy.....50%
 Waxberry.....20%
 Wild rose....15%
 Pyramidal
 spirea.....15%

Plot 18
 Timothy.....50%
 Pyramidal
 spirea.....10%
 Harefoot
 sedge.....10%
 Waxberry.....10%
 Wild rose....10%
 Kentucky
 bluegrass...10%

Plot 19
 Harefoot
 sedge.....35%
 Timothy.....25%
 Pyramidal
 spirea.....10%
 Wild rose....10%
 Oregon grape. 5%
 Kentucky
 bluegrass... 5%
 Yarrow..... 5%
 Dandelion.... 5%

Plot 20
 Harefoot
 sedge.....55%
 Wild rose....15%
 Kentucky
 bluegrass...10%
 Yarrow.....10%
 Timothy..... 5%
 Waxberry..... 5%

Plot 21
 Oregon grape.60%
 Waxberry.....15%
 Kentucky
 bluegrass...10%
 Harefoot
 sedge..... 5%
 Pyramidal
 spirea..... 5%
 Timothy..... 5%

Plot 22
 Kentucky
 bluegrass...30%
 Wild rose....30%
 Lupine.....15%
 Yarrow.....15%
 Pyramidal
 spirea.....10%

Plot 23
 Kentucky
 bluegrass...35%
 Lupine.....20%
 Wild rose....15%
 Pyramidal
 spirea.....15%
 California
 brome..... 5%
 Timothy..... 5%
 Cinquefoil... 5%

Plot 24
 Pyramidal
 spirea.....25%
 Wild rose....15%
 Kentucky
 bluegrass...15%
 Lupine.....15%
 Timothy.....15%
 Western
 needlegrass.10%
 Cinquefoil... 5%

Plot 25
 Lupine.....40%
 Timothy.....20%
 Pyramidal
 spirea.....15%
 Wild rose....10%
 Harefoot
 sedge..... 5%
 Kentucky
 bluegrass... 5%
 Western
 needlegrass. 5%

Plot 26
 Lupine.....35%
 Waxberry.....20%
 Wild rose....15%
 Kentucky
 bluegrass...10%
 Timothy.....10%
 Harefoot
 sedge.....10%

Plot 27
 Wild rose....40%
 Timothy.....25%
 Waxberry.....20%
 Lupine.....10%
 Harefoot
 sedge..... 5%

Plot 28
 Harefoot
 sedge.....35%
 Wild rose....15%
 Yarrow.....15%
 Oregon grape.15%
 Waxberry.....10%
 Kentucky
 bluegrass... 5%
 Lupine..... 5%

Plot 29
 Lupine.....35%
 Timothy.....20%
 Wild rose....15%
 Waxberry.....15%
 Yarrow.....10%
 Oregon grape. 5%

Plot 30
 Wild rose....35%
 Lupine.....15%
 Kentucky
 bluegrass...15%
 California
 brome.....10%
 Yarrow.....10%
 Waxberry.....10%
 Oregon grape. 5%

Plot 31
 Wild rose....40%
 Western
 needlegrass.35%
 Oregon grape.15%
 Waxberry.....10%

Plot 32
 middle of road
 - no vegetation

* edge of road

Plot 33
 Saskatoon
 berry.....90%
 Wild rose....10%
 * edge of road

Plot 34
 Kentucky
 bluegrass...25%
 Yarrow.....15%
 Oregon grape.15%
 Harefoot
 sedge.....15%
 Waxberry.....10%
 California
 brome..... 5%
 Wild rose.... 5%
 Lupine..... 5%
 Timothy..... 5%

Plot 35
 Waxberry.....30%
 Kentucky
 bluegrass...25%
 Wild rose....15%
 Oregon grape.15%
 Yarrow.....10%
 Timothy..... 5%

Plot 36
 Waxberry.....35%
 Kentucky
 bluegrass...25%
 California
 brome.....25%
 Timothy.....10%
 Yarrow..... 5%

Plot 37
 Saskatoon
 berry.....45%
 Oregon grape.25%
 Wild rose....10%
 Timothy..... 5%
 Harefoot
 sedge..... 5%
 Waxberry..... 5%
 California
 brome..... 5%

Plot 38
 Wild straw-
 berry.....20%
 Oregon grape.15%
 California
 brome.....15%
 Timothy.....15%
 Yarrow.....15%
 Waxberry.....10%
 Cinquefoil... 5%
 Kentucky
 bluegrass... 5%

Plot 39
 Wild rose....35%
 Oregon grape.20%
 Timothy.....15%
 Harefoot
 sedge.....10%
 California
 brome.....10%
 Waxberry..... 5%
 Yarrow..... 5%

Plot 40
 Oregon grape.50%
 Lupine.....25%
 Timothy.....10%
 Wild rose....10%
 Kentucky
 bluegrass... 5%

<u>Plot 41</u>	<u>Plot 42</u>
Oregon grape.55%	Saskatoon
Wild rose....25%	berry.....45%
Wild straw-	Oregon grape.45%
berry.....10%	Horsetail.... 5%
Horsetail.... 5%	Thistle..... 5%
White clover. 5%	

The portion of the meadow sampled by the above transect terminates on a backwater of Ross Lake rather than at the forest edge, as is the case elsewhere around the perimeter of the meadow. There is an abrupt elevation drop of 2m-3m from the meadow proper to the poorly drained area. This latter area is predominately willow 3m-5m high interspersed by the occasional cottonwood 7m-10m high. The understory varies with the microtopography and includes aquatic species eg. horsetail, reed-canary grass and various rush species, and upland species eg. rose, timothy. At the time of this study the area contained small patches of surface water throughout due to the current level of Ross Lake. During low water periods on the reservoir i.e. fall and winter, the backwater area would be relatively dry.

TRANSECT #6

- bearing 225° from start point.

a) Meadow (0m-105m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4</u>
Kentucky	Harefoot	Harefoot	Lupine.....25%
bluegrass...20%	sedge.....25%	sedge.....25%	Waxberry.....15%
Western	Timothy.....20%	Timothy.....20%	California
needlegrass.20%	Kentucky	Pyramidal	brome.....15%
Yarrow.....20%	bluegrass...20%	spirea.....20%	Timothy.....15%
Lupine.....15%	Cinquefoil...15%	Yarrow.....15%	Harefoot
Cinquefoil...10%	Pyramidal	Kentucky	sedge.....10%
Harefoot	spirea.....15%	bluegrass...10%	Yarrow.....10%
sedge.....10%	Yarrow..... 5%	Cinquefoil...10%	Kentucky
Oyster plant. 5%			bluegrass... 5%
			Cinquefoil... 5%

<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u> *	<u>Plot 8</u> *
Timothy.....35%	Western	Timothy.....20%	Pyramidal
Lupine.....20%	needlegrass.25%	bare.....80%	spirea.....25%
Wild rose....15%	Pyramidal		Waxberry.....20%
Pyramidal	spirea.....25%	* on road	Timothy.....20%
spirea.....15%	Timothy.....20%		Harefoot
Kentucky	Kentucky		sedg.....20%
bluegrass...10%	bluegrass...20%		Wild rose....15%
Yarrow..... 5%	Wild rose.... 5%		
	Lupine..... 5%		* edge of road

<u>Plot 9</u> Harefoot sedge.....35% Pyramidal spirea.....30% Kentucky bluegrass...10% Waxberry.....10% Lupine..... 5% Wild straw- berry..... 5% Timothy..... 5%	<u>Plot 10</u> Timothy.....20% Cinquefoil...15% Pyramidal spirea.....15% Western needlegrass.15% California brome.....15% Kentucky bluegrass...10% Lupine..... 5% Yarrow..... 5%	<u>Plot 11</u> Pyramidal spirea.....30% California brome.....25% Cinquefoil...15% Yarrow.....10% Lupine.....10% Kentucky bluegrass...10%	<u>Plot 12</u> California brome.....55% Timothy.....20% Pyramidal spirea.....15% Yarrow..... 5% Wild rose.... 5%
<u>Plot 13</u> Timothy.....20% Lupine.....20% Cinquefoil...15% Pyramidal spirea.....15% Wild rose....10% California brome.....10% Kentucky bluegrass... 5% Waxberry..... 5%	<u>Plot 14</u> California brome.....40% Wild rose....25% Timothy.....15% Lupine..... 5% Pyramidal spirea..... 5% Waxberry..... 5% Kentucky bluegrass... 5%	<u>Plot 15</u> Kentucky bluegrass...25% Harefoot sedge.....25% Wild rose....20% Waxberry.....10% Cinquefoil...10% Timothy..... 5% Yarrow..... 5%	<u>Plot 16</u> Oregon grape.40% Wild rose....15% California brome.....15% Harefoot sedge.....15% Waxberry..... 5% Yarrow..... 5% Cinquefoil... 5%
<u>Plot 17</u> Kentucky bluegrass...85% Lupine..... 5% Oregon grape. 5% Yarrow..... 5%	<u>Plot 128</u> Kentucky bluegrass...55% Wild rose....15% Waxberry.....10% Timothy..... 5% Dandelion.... 5% Lupine..... 5% Yarrow..... 5%	<u>Plot 19</u> Kentucky bluegrass...30% Oregon grape.30% Wild rose....15% Waxberry.....10% Yarrow..... 5% Dandelion.... 5% Purple pea... 5%	<u>Plot 20</u> Lupine.....50% Oregon grape.25% Waxberry.....15% Wild rose....10%
<u>Plot 21</u> Lupine.....35% Oregon grape.35% Wild rose....20% Waxberry.....10%			

b) Forest (105m)

Overstory B5B3

- a grand fir overstory, 81-100 years old, 31-70% crown closure, 20m-29m high.

Understory

- varied in density from sparse under closed canopy to medium -good in open crown areas. Vegetation species included maple, huckleberry, thimbleberry, Oregon grape, Saskatoon berry, hawthorn, red-osier dogwood and wild rose.

TRANSECT #7

- bearing 270° from start point.

a) Meadow (0m-80.1m)

<u>Plot 1</u>	<u>Plot 2</u>	<u>Plot 3</u>	<u>Plot 4</u>
Kentucky	Harefoot	Saskatoon	Kentucky
bluegrass...45%	sedge.....40%	berry.....65%	bluegrass...35%
Harefoot	Kentucky	Waxberry.....15%	Western
sedge.....30%	bluegrass...40%	Harefoot	needlegrass.35%
Yarrow.....15%	Wild rose....10%	sedge.....10%	Pyramidal
Western	Timothy.....10%	Kentucky	spirea.....15%
needlegrass.10%		bluegrass... 5%	Harefoot
		Pyramidal	sedge.....10%
		spirea..... 5%	Timothy..... 5%
<u>Plot 5</u>	<u>Plot 6</u>	<u>Plot 7</u>	<u>Plot 8</u>
Kentucky	Lupine.....25%	Wild rose....25%	Oregon grape.20%
bluegrass...25%	Kentucky	Oregon grape.20%	Wild rose....20%
Western	bluegrass...20%	Harefoot	Lupine.....15%
needlegrass.25%	Oregon grape.15%	sedge.....15%	Waxberry.....15%
Pyramidal	Waxberry.....15%	Kentucky	Timothy..... 5%
spirea.....15%	Wild rose....15%	bluegrass...15%	Purple pea... 5%
Timothy.....15%	Red clover... 5%	Waxberry.....15%	Log.....20%
Wild rose....10%	Timothy..... 5%	Cinquefoil... 5%	
Waxberry..... 5%		Pyramidal	
Indian Paint		spirea..... 5%	
brush..... 5%			
<u>Plot 9</u>	<u>Plot 10</u>	<u>Plot 11</u>	<u>Plot 12</u>
Wild rose....55%	Harefoot	Wild rose....50%	Wild rose....70%
Harefoot	sedge.....30%	Oregon grape.10%	Waxberry.....15%
sedge.....20%	Pyramidal	Harefoot	Oregon grape. 5%
Yarrow..... 5%	spirea.....15%	sedge.....10%	Harefoot
Lupine..... 5%	Waxberry.....15%	Kentucky	sedge..... 5%
Waxberry..... 5%	Wild rose....15%	bluegrass...10%	Timothy..... 5%
Kentucky	Timothy.....10%	Waxberry.....10%	
bluegrass... 5%	Oregon grape.10%	California	
Oregon grape. 5%	Lupine..... 5%	brome..... 5%	
		Pyramidal	
		spirea..... 5%	

Plot 13	Plot 14	Plot 15	Plot 16
Wild rose....55%	Wild rose....75%	Wild rose....75%	Wild rose....50%
Grand fir....25%	Waxberry.....15%	Oregon grape.10%	Grand fir....20%
Waxberry.....10%	Oregon grape.10%	Horsetail.... 5%	Waxberry.....20%
Red-osier		Timothy..... 5%	Horsetail.... 5%
dogwood..... 5%		Pyramidal	Cinquefoil... 5%
Timothy..... 5%		spirea..... 5%	

b) Forest (80.1m)

Overstory B4A3

- a grand fir overstory, 61-80 years old, 0-30% crown closure, 20m-29m high.

Understory

- conifer cover is sparse and in a thin band along the meadow edge. Behind this band of old conifers the tree cover is predominantly deciduous (willow, alder, cottonwood) interspersed with younger conifers. The height of this deciduous-conifer mix varies from 7m-20m. These form a canopy that is much denser than that of the old conifers. The understory of this deciduous-young conifer stand varies in density from fair to good. It includes red-osier dogwood, willow, rose, thistle, horsetail, harefoot sedge, timothy, thimbleberry and Oregon grape.

Note: Between the end of Transect 6 and Transect 7 a fairly robust stand of aspen appears to be encroaching on the meadow.

TRANSECT #8

- bearing 315° from start point.

a) Meadow (0m-95.2m)

Plot 1	Plot 2	Plot 3	Plot 4
Kentucky	Kentucky	Timothy..... 5%	Oregon grape.25%
bluegrass...55%	bluegrass...80%	bare.....95%	Kentucky
Harefoot	Wild rose....10%		bluegrass...20%
sedge.....15%	Wild straw-	* on the road	Harefoot
Western	berry..... 5%		sedge.....20%
needlegrass.10%	Saskatoon		Wild rose....15%
California	berry..... 5%		Pyramidal
brome.....10%			spirea.....10%
Cinquefoil... 5%			Waxberry.....10%
Yarrow..... 5%			

Plot 5
Oregon grape.35%
Waxberry.....20%
Pyramidal
spirea.....20%
Lupine.....15%
Kentucky
bluegrass..10%

Plot 6
Oregon grape.35%
Wild rose....30%
Pyramidal
spirea.....15%
Waxberry.....15%
Timothy..... 5%

Plot 7
Oregon grape.40%
Waxberry.....25%
Wild rose....10%
Kentucky
bluegrass...10%
Harefoot
sedge.....10%
Timothy..... 5%

Plot 8
Waxberry.....30%
Timothy.....20%
Lupine.....15%
Wild rose....10%
Kentucky
bluegrass...10%
California
brome..... 5%
Yarrow..... 5%
Oregon grape. 5%

Plot 9
Kentucky
bluegrass...30%
Wild rose....25%
Harefoot
sedge.....20%
Lupine.....10%
Yarrow.....10%
Oregon grape. 5%

Plot 10
Harefoot
sedge.....35%
Kentucky
bluegrass...20%
Lupine.....20%
Wild rose....15%
Cinquefoil...10%

Plot 11
Harefoot
sedge.....40%
Wild rose....25%
Cinquefoil...20%
Lupine..... 5%
Yarrow..... 5%
Timothy..... 5%

Plot 12
Harefoot
sedge.....25%
Kentucky
bluegrass...25%
Lupine.....25%
Western
needlegrass.10%
Cinquefoil...10%
Wild rose.... 5%

Plot 13
Timothy.....65%
Wild rose....15%
Kentucky
bluegrass...10%
Waxberry..... 5%
Cinquefoil... 5%

Plot 14
Waxberry.....40%
Timothy.....30%
Lupine.....15%
Harefoot
sedge.....15%

Plot 15
Waxberry.....45%
Harefoot
sedge.....30%
Lupine..... 5%
Kentucky
bluegrass... 5%
Western
needlegrass. 5%
Timothy..... 5%
Yarrow..... 5%

Plot 16
Waxberry.....70%
Timothy.....20%
Harefoot
sedge..... 5%
Lupine..... 5%

Plot 17
Waxberry.....75%
Lupine.....15%
Wild rose.... 5%
Kentucky
bluegrass... 5%

Plot 18
Oregon grape.50%
Wild rose....35%
Lupine.....10%
Waxberry..... 5%

Plot 19
Grand fir....80%
Wild Rose....10%
Waxberry.....10%

b) Forest (95.2m)

Overstory B4A3

- a grand fir overstory, 61-80 years old, 0-30% crown closure, 20m-29m high.

Understory

- fairly luxurious understory due to openness of the crown closure. Species present included wild rose, young fir, pyramidal spirea, huckleberry, maple, thimbleberry, aspen, alder and some taller cottonwood.

APPENDIX 4. Vegetation List of Plant Species Commonly Occurring in Study Plots - Ponderosa Meadow, Lower Skagit Valley, June 1986.

	<u>Common Name</u>	<u>Scientific Name</u>
<u>Trees</u>		
	Grand fir	<u>Abies grandis</u>
	Douglas fir	<u>Pseudotsuga menziesii</u>
	Red alder	<u>Alnus ruba</u>
	Maple	<u>Acer spp.</u>
	Trembling aspen	<u>Populus tremuloides</u>
	Northern black cottonwood	<u>Populus trichocarpa</u>
	Hawthorn	<u>Crataegus spp.</u>
<u>Shrubs</u>		
	Western wild rose	<u>Rosa woodsii var. ultranontana</u>
	Red-osier dogwood	<u>Cornus occidentalis</u>
	Oregon grape	<u>Berberis nervosa</u>
	Waxberry	<u>Symphoricarpos albus</u>
	Thimbleberry	<u>Rubus parviflora</u>
	Saskatoon berry	<u>Amelanchier alnifolia</u>
	Willow	<u>Salix spp.</u>
	Elderberry	<u>Sambucus spp.</u>
	Pyramidal spirea	<u>Spirea pyramidata</u>
	Red Huckleberry.	<u>Vaccinium parvifolium</u>
<u>Forbs/Flowers</u>		
	Cinquefoil	<u>Potentilla nuttallii</u>
	Lupine	<u>Lupinus spp.</u>
	Wild strawberry	<u>Fragaria vesca var. crinita</u>
	Yarrow	<u>Achillea millefolium</u>
	Fireweed	<u>Eqilobium angustifolium</u>
	Oyster plant	<u>Tragopogon dubius</u>
	Bracken fern	<u>Pteridium aquilinum pubescens</u>
	Purple pea	<u>Lathyrus nevadensis</u>
	Dandelion	<u>Tavaxacum spp.</u>
	Trillium	<u>Trillium ovatum</u>
	Indian paintbrush	<u>Castilleja spp.</u>
	White clover	<u>Trifolium repens</u>
	Thistle	<u>Cirsium spp.</u>
	Horsetail	<u>Equisetum spp.</u>
	Red clover	<u>Trifolium pratense</u>
	Marestail	<u>Hippuris vulgaris</u>
	Red twinberry	<u>Lonicera utahensis</u>
<u>Grasses/Sedges</u>		
	Kentucky bluegrass	<u>Poa pratensis</u>
	Western needlegrass	<u>Stipa occidentalis</u>
	California brome	<u>Bromus carinatus</u>
	Harefoot sedge	<u>Carex leporina</u>
	Timothy	<u>Phleum pratense</u>