1976

Description of Aspen Communities and Related Wildlife Populations in the Phosphate Strip Mining Area of Southeastern, Idaho

David S. Winn

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ABSTRACT

The study objectives were:

(1) to compile an inventory of major terrestrial vertebrate populations existing in selected aspen *(Populus tremuloides* Michx.) communities,

(2) to describe major aspen communities,

(3) to relate indices of terrestrial vertebrate populations to major aspen community types, and

(4) to propose recommendations for developing management philosophies associated with aspen community types.

The study was completed during the 1976 summer, near areas of active phosphate strip mining, on the Soda Springs Ranger District, Caribou National Forest, Idaho. Detailed descriptions of community vegetation associated with 29 aspen stands is provided. For each stand, tree populations, basal areas, and downed woody material are summarized. Six aspen community phases and the associated terrestrial vertebrates are discussed.

The following major recommendations are suggested.

(1) Permanent plots for developing historical relationships and comparisons between aspen communities which will and will not be modified by mining or other resource manipulations should be established.

(2) Future efforts to habitat type aspen communities should include analysis of community structures and indices of wildlife densities.

(3) To enhance bird populations, management options should be considered which create a diversity of stand structures within a series of community types.

(69 pages)

INTRODUCTION

Justification

Within the Rocky Mountain Region, quaking aspen *(Populus tremuloides* Michx.) communities are prevalent on 2.5 million hectares. Daubenmire (1943), Hoff (1957), and others have considered aspen communities throughout the Western United States as seral communities within the coniferous ecosystem. Lynch (1955) and Reed (1971) view some aspen types as stable communities. Apparently the rate that aspen communities convert to conifer types is a function of site potential (Bartos, 1973). However, regardless of one's opinion on the successional pattern of aspen, this ecosystem should be recognized as a valuable resource in multiple resource management schemes.

Currently there are demands by the general public and private enterprise to determine the relationships between wildlife populations and various aspen community types. In addition, base line data which associates aspen habitat with wildlife densities is needed to coordinate resource manipulations associated with strip mining in Southeastern Idaho. This study was initiated to determine basic and reliable scientific information for integration into resource management philosophies.

Objectives

The primary objective of this study was to compile an inventory of major terrestrial vertebrate populations existing in selected aspen

communities. Specific objectives were to:

a. describe major aspen communities,

b. to relate indices of terrestrial vertebrate populations to these aspen communities and

c. propose recommendations for developing management philosophies associated with aspen communities.

STUDY AREA

Geographic Location and Physiography

The study area (65,000 ha) was located 30 kilometers northeast of Soda Springs, Idaho. The area was part of the Soda Springs Ranger District located in the Caribou National Forest. Predominate geographic features included: Wooley Range, Grays Range (Sheep Creek), Rasmussen Ridge, Dry Ridge (Mill Canyon, Kendall Canyon, Campell Canyon, Maybe Canyon) and Schmid Ridge (Caldwell Canyon). Upper Valley, Dry Valley, and Rasmussen Valley are generally flat and broken by the Blackfoot River and its major tributaries (Diamond Creek, Lanes Creek, Angus Creek, and Dry Valley Creek).

Throughout the study area, landforms resulted from horizontal thrust faulting and subsequent erosion. The elevation varies between 1900 and 2700 m and drainages are generally steep (15 to 50% slope).

Climate

The climate of the area is dominated by pacific-maritime air flows with occasional modifications to weather patterns resulting from Arctic, California Gulf, and Gulf of Mexico air masses. Summers are dry and 54% of the annual precipitation occurs as snow between November and April. The annual precipitation varies between 50 and 91 cm.

Temperatures range between -41° and 33°C, with an average July temperature of 14°C. The growing season averages 50 days.

Snow accumulation begins at higher elevations by November. By January the entire study area is snow covered. Snow depths vary from 0.15m on wind blown ridges of south and west facing ridgetops to 2 m in the valley bottoms and on northeast facing slopes.

Soil and Vegetation

The soil potentials throughout the study area for production of forage, timber, and revegetation are considered moderate. The inherent hazard of surface soil erosion ranged from low to high depending on the slope and present vegetation.

Floral mosaics reflect the local aspect, elevation, moisture, temperature, and soil conditions. Aspen, coniferous, and sage *(Artemisia sp.)* communities occur from the lowest to highest elevation. In general, only a few large areas of any single community type are found and lodgepole pine *(Pinus contorta)* or aspen occur on many sites considered potential Douglas fir *(Pseudotsuga taxifolia)* climax.

METHODS

Field Methods

Because this study was limited to one summer season, sampling did not attempt to insure that vertebrate populations are stable. It is assumed that the distributions of vertebrate populations throughout the study area are not appreciably modified by population density.

For each sampling unit the following data were recorded:

(1) stand number

(2) elevation

(3) aspect, and

(4) slope (%).

Twenty of the stand's tallest trees were measured to calculate stand height.

Plots (375 m^2, 0.09 acre) were placed in stands to sample homogenous units of overstory and understory vegetation. Sites were selected which avoided community ecotones and areas heavily grazed by domestic livestock.

The procedure associated with site selection, plot size, and orientation are discussed in detail by Daubenmire and Daubenmire (1968). In general, the plots were oriented with the long axis parallel to existing contours. Plot sides were outlined with stretched tapes. Two additional tapes divided the plot into three macroplots (5 x 15 m). Along each boundary tape, 20 microplots (20 x 50 cm) were placed at 1 m intervals. Thus, each sampling unit consisted of

80 microplots and three macroplots. This procedure was replicated three times at each site.

Within each macroplot, tree species were tallied by breast-height diameter classes (see Tables 11 - 16). Dead trees were tallied separately.

For each understory plant species, canopy coverage was recorded in one of six classes:

(1) < 1%

(2) 1-4%

(3) 5-14%

(4) 15-24%

(5) 25-49%

(6) <50%.

The presence or absence of hare, deer, elk, and moose pellet groups was recorded for each plot. In addition, the presence of middens and gopher mounds was recorded for each microplot.

Downed woody material for each sampling unit was measured as outlined by Brown (1974). This planar intersect technique inventories naturally fallen woody material, and has the same theoretical basis as line intersect methods (Van Wagner, 1968). To facilitate data collection and economize time, the 15 m ends of the stretched boundary tapes defined eight sampling planes for each sampling unit.

Bird communities associated with each sampling unit were evaluated by three (1.5 hr) cruising surveys across a 100 x 200 m area (2 ha, 5 acres). When terrain permitted, the census area was centered on the sampling unit. Censuses were conducted during the early morning and

evening hours. Generally, twelve minutes were spent standing at a point, recording all birds seen or heard, and then proceeding to another point. This routine was continued for a total of five standing and four walking periods. An attempt was made not to recount birds with loud calls, or wandering birds. Birds flying high overhead were excluded. Bond (1957) and Beals (1960) used a similar approach, and found the counts to be reasonable estimates of the relative densities of bird populations.

The small mammals at each sampling unit were inventoried with systematic trapping grids which consisted of five rows and six columns. Thirty stations (two standard rats traps with enlarged bait treadles) spaced at 15 m intervals were baited with a mixture of grains, bacon fat, and peanut butter. The trapping grid (0.5 ha, 1.2 acre) was centered on the sampling unit. Each site was trapped for five nights (300 trap nights).

Common and scientific names for important understory and vertebrate species are listed in Appendix A (Tables 8 - 10).

DATA ANALYSIS

Basal Area

Basal areas for each stand and tree species were calculated by summing the basal areas for each stem diameter class.

Plant Communities

Plant species data were coded and computer programs converted plot data into association tables. In addition, a two dimensional coefficient of similarity between sampling units was calculated. This procedure is outlined by Bray and Curtis (1957) and results in an index which varies from 0.0 to 1.0. The larger index value delineates communities which are most alike. From these calculations, sampling units were grouped into possible community units.

To develop the final community groups, similarity indices calculated from each sampling unit's tree data were clustered. Rea (1975) and Taush (1976) coded sub-routines for the Burroughs 6700 computer, which develops a similarity matrix based on Sorensen's K (Sorensen, 1948). The clustering of sampling units begins by joining the two sites with the most similar matrix values. Succeeding clusters are formed by a weighted pair group method (Ward, 1963). In addition to the tree attributes, sites were clustered with an euclidian sub-routine, which calculated euclidean point distance squared from the presence or absence of understory species.

The computer program explanation and theoretical bases were derived from Pyott (1972). The general methodology attempts to minimize within group variance, however, in some instances the final grouping of stands was based on personal judgement.

RESULTS

Community Types

Habitat types described for aspen sites within the study area are incomplete and pending data collection and analyses. As such, sampling units were grouped into six community types (Table 1 and Table 2). Data supportive of these classifications are presented in Appendix B and Appendix C. Appendix B (Tables 11 - 16) presents a summary of tree overstories. Appendix C is a summary of the canopy coverage of understory plant species. In some cases, broad community types (phases) delineated as phases, are based on minor floral variations. Communities are presented along a gradient based on the presence or absence of coniferous species.

Table 3 presents a summary of downed woody material associated with each community.

Aspen/Snowberry Communities

The absence of conifer species and abundant snowberry, delineates this phase (Tables 11 and 17). Stem lengths varied between 11 to 18 m ($\bar{X}$ = 13.7 m). Average live tree basal areas (27.0 m^2/ha) and above average amounts of standing dead aspen (4.3 m^2/ha) were found on these sites (Tables 1 and 11).

Aspen/Snowberry Communities were found on western aspects with slopes that ranged between 10 and 25% (Table 17).

Major understory species included nodding brome, poa, cinquefoil, common dandelion, horsemint, meadow rue, osmorhiza, pink geranium,

Table 1. Basal area statistics for Aspen Community tree species within the Soda Springs Ranger District, Idaho Study Area.

	Basal Area (m^2/ha)					
Community Number[a]	1	2	3	4	5	6
Number of Stands	5	3	7	6	3	5
Tree Species						
Aspen $\bar{X}$	27.0	14.0	25.6	25.7	22.5	35.7
	(100)[b]	(95)	(84)	(86)	(96)	.
s.e.[c]	0.8	0.7	1.8	2.0	1.6	1.0
Douglas Fir $\bar{X}$	.	0.7	5.0	0.2	0.9	.
	.	(5)	(16)	(1)	(4)	.
s.e.	.	0.3	1.9	0.1	0.2	.
Alpine Fir $\bar{X}$	.	.	.	.	.	5.1
	.	.	.	.	.	.
s.e.	.	.	.	.	.	0.5
Lodgepole Pine $\bar{X}$	.	.	.	4.0	.	.
	.	.	.	(13)	.	.
s.e.	.	.	.	0.6	.	.
Total Basal Area $\bar{X}$	27.0	14.7	30.6	29.9	23.4	40.8
s.e.	0.8	0.4	0.8	2.1	1.6	0.9
Standing Deadwood Basal Area for Aspen Communities						
Aspen $\bar{X}$	4.3	6.8	1.7	1.2	2.0	0.1
s.e.	0.7	0.6	0.6	0.3	0.9	0.1

[a] Community numbers: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[b] Percent of total basal area.

[c] Standard error (s.e.).

Table 2. Aspect, slope, and percent canopy coverage class for major understory species in Aspen Communities in the Soda Springs Ranger District, Idaho Study Area.

	Community Number[1]					
	1	2	3	4	5	6
General Aspect	SW-NW	SW-SE	NW-E	SE	SW-NE	SW
General Slope %	22	30	26	18	22	28
Species	Mean Community Coverage Class[2]					
Shrubs						
Chokecherry	2	6	.	1	.	.
Current	.	1	.	.	.	1
Mountain Lover	.	.	4	2	.	1
Oregon Grape	1	1	1	.	.	.
Rose	2	2	2	1	2	2
Service Berry	1	.	5	.	.	.
Snowberry	5	2	2	5	1	2
Snow Brush	.	.	2	3	.	2
Thimble Berry	.	1	.	1	.	2
Graminoids						
Alpine Timothy	1	.	.	.	2	.
Bluebunch Fescue	1	.	1	.	2	.
Needlegrass	3	2	2	1	3	3
Nodding Brome	4	3	1	2	3	5
Oniongrass	.	.	.	1	.	1
Pinegrass	.	.	3	5	.	3
Poa	3	.	2	2	3	2
Sedge	3	2	.	2	1	3
Timothy	.	.	.	.	3	.
Wild Rye	2	3	3	2	3	3
Forbs						
Aster	.	.	2	2	.	.
Bedstraw	2	.	1	2	1	1
Bog Orchid	1	.	2	1	.	1
Cinquefoil	2	.	1	1	3	2
Columbine	.	.	1	.	.	1
Common Dandelion	2	1	2	.	2	2
Coneflower	.	3	.	.	.	4
Cow Parsnip	.	.	1	.	.	2
Everlasting	1	.	1	.	1	.
Fleabane	.	2	.	1	.	1
Goldenrod	2	1	.	.	.	.
Hawkweed	.	.	1	1	.	1

Table 2. Continued

	Community Number[1]					
	1	2	3	4	5	6
General Aspect	SW-NW	SW-SE	NW-E	SE	SW-NE	SW
General Slope %	22	30	26	18	22	28
Species	Mean Community Coverage Class[2]					
Heartleaf Arnica	.	2	.	3	.	1
Horsemint	2	2	.	1	1	2
Indian Paintbrush	1	.	2	2	3	2
Lupine	3	.	2	3	2	3
Meadow Rue	3	3	3	2	2	3
Meadow Salsify	.	1	.	.	.	.
Milkweed	.	1	.	.	.	.
Mountain Dandelion	1	.	1	1	.	1
Osmorhiza	3	3	3	2	2	2
Pedicularis	.	.	.	1	1	1
Pink Geranium	2	3	3	3	3	5
Sego Lily	.	.	.	1	.	.
Sunflower	.	2	.	.	.	2
Tall Larkspur	.	1	.	1	.	2
Thistle	.	.	.	1	.	.
Violet	2	.	1	1	2	3
Wild Strawberry	2	3	2	3	2	3
Yampa	.	1	1	1	.	.
Yarrow	2	.	2	2	2	2

[1] Community numbers are: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[2] Canopy coverage classes are: 1. Trace 1%, 2. Common 1-4%, 3. Well represented 5-14%, 4. Abundant 15-24%, 5. Abundant 25-49%, 6. Abundant 50%.

Table 3. Summary of downed woody material (kg/ha)[a] for each Aspen Community type in the Soda Springs Ranger District, Idaho Study Area.

Community No.[b]	Downed Woody Structure Kg/ha 0-3"	Sound Logs	Rotten Logs	Total	Fuel Height (cm)
1. $\bar{X}$	519	591	124	1234	93
s.e.[c]	79	35	81	95	7
2. $\bar{X}$	985	919	403	2307	62
s.e.	170	122	31	257	5
3. $\bar{X}$	1158	900	0	2058	93
s.e.	144	148	0	124	6
4. $\bar{X}$	534	106	0	640	50
s.e.	126	62	0	159	6
5. $\bar{X}$	228	272	0	500	46
s.e.	74	134	0	117	6
6. $\bar{X}$	396	1141	0	1537	60
s.e.	75	160	0	197	7

[a] Calculated as outlined by Brown (1974).

[b] Community numbers: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[c] Standard Error (s.e.).

and yarrow. Sedge, bedstraw, goldenrod, and violet were also commonly found on these sites.

Downed woody material had accumulated to 1230 kg/ha (10% rotten material) and 90 cm fuel heights were above average (see Table 3).

Aspen/Chokecherry Communities

Sites with abundant chokecherry shrubs and minor amounts of Douglas fir constitute the Aspen/Chokecherry Phase (Tables 12 and 18). Tree lengths ranged between 11 and 17 m ($\bar{X}$ = 14.6 m), and Douglas fir stems did not exceed the sapling stage. Aspen basal areas were below average (14.7 m^2/ha) and large amounts of standing dead aspen (6.8 m^2/ha) denoted stands with open canopies (see Tables 1 and 12).

Aspen/Chokecherry stands were located on southern aspects and on slopes that varied between 25 - 35% (see Table 18).

In addition to chokecherry, rose and snowberry shrubs were generally common. Major understory plant species were nodding brome, poa, sedge, goldenrod, horsemint, meadow rue, osmorhiza, pink geranium, wild strawberry, and yarrow.

Downed woody material accumulations (2310 kg/ha, 17% rotten) were the heaviest of all phases and fuel height average 60 cm (see Table 3).

Aspen/Service Berry-Mountain Lover Communities

Aspen stands with invading Douglas fir and abundant service berry and mountain lover canopies designated this phase (Tables 13 and 19). Aspen stems varied between 11 and 17 m ($\bar{X}$ = 14.6 m) in length. Douglas fir trees averaged 11 m in length. Aspen basal areas (25.6 m^2/ha)

were average, while Douglas fir basal areas (5.0 m^2/ha) were notably higher than other phases (see Table 1). Basal areas for standing dead aspen averaged 1.7 m^2/ha.

Aspen/Service Berry-Mountain Lover sites were generally on northerly aspects and slopes ranged from 10 to 35% (see Table 19).

Wild rose and snow brush were common shrubs. Pinegrass and poa were the most common graminoids. Lupine, meadow rue, osmorhiza, pink geranium, and yarrow were present on each site in this phase. Bog orchid, cinquefoil, common dandelion, and Indian paintbrush were observed in 86% of the stands.

Downed woody material accumulations exceed 2000 kg/hg and fuel heights averaged 90 cm (see Table 3).

Aspen-Lodgepole Pine Communities

Stands of aspen in which lodgepole pine was the dominate conifer species were classed as Aspen-Lodgepole Pine Communities (Table 14 and 20). Snowberry was a well represented shrub in this phase. The average length of aspen stems was 11 m. Lodgepole pine stems ranged between 8 and 15 m ($\bar{X}$ = 11.6) in length. Aspen basal areas averaged 25.7 m^2/ha, lodgepole pine 4.0 m^2/ha, and Douglas fir 0.2 m^2/ha (see Table 1). Standing dead aspen basal areas averaged 2.0 m^2/ha.

Aspen-Lodgepole Pine sites were located on southeast aspects with slopes between 15 and 20% (see Table 20).

Snow brush was common to abundant on 83% of the sites. Pinegrass was the only graminoid present on all sites. However, sedge was well represented to abundant on 5 out of 6 sites. Lupine,

osmorhiza, pink geranium, wild strawberry, and yarrow were common in all stands. Common dandelion was absent from this phase.

In this phase accumulated downed woody material (640 kg/ha) and fuel heights (50 cm) were below the overall average (see Table 3).

Aspen-Douglas Fir/Grass Communities

Aspen stands with invading Douglas fir, understories consisting of predominately grass and forbs, and little or no shrub canopy were grouped as Aspen-Douglas Fir/Grass Communities (Tables 15 and 21). Trace amounts of snowberry were generally present. The average aspen stem length is 11 m. Douglas fir lengths average 6 m.

When compared with other phases, aspen basal areas (22.5 m^2/ha) in this phase were below average. Douglas fir basal area (0.9 m^2/ha) appeared to be increasing (see Table 1). Basal areas of standing dead aspen were average (2.0 m^2/ha).

The general aspect for this phase was northeast. However, one site with a southwest aspect was located midway up the north side of a long ridge (see Table 21). Slopes averaged 22% (see Table 2).

Nodding brome, poa, and wild rye were persistent graminoids in this phase. The understory constituents of this phase were very consistent (see Table 21). Of 14 forb species, only two species (horsemint and pedicularis) were not present in each stand.

The Aspen-Douglas Fir/Grass Community is characterized by low dead woody material accumulations (500 kg/ha) and 45 cm fuel heights

(see Table 3).

Aspen-Alpine Fir/Grass Communities

Aspen stands with minor shrub canopies (mountain lover and snowberry) and basal areas comprised of alpine fir (> 5%) were classed as Aspen-Alpine Fir/Grass Communities (Tables 16 and 22). Aspen stem lengths averaged 17 m and alpine fir stem lengths were 10 m tall.

Compared with other phases, this phase had the largest basal area (40.8 m^2/ha) and the smallest amount (0.1 m^2/ha) of standing dead aspen (see Table 1).

All units sampled were on southwest aspects and slopes ranged from 18 to 30% (see Table 22).

The Aspen-Alpine Fir/Grass Community has notably the largest number (38, $\bar{X}$ = 25) of understory species (see Table 22). Five graminoids and eight forb species occurred in every stand. Major constituents of the forb canopy were coneflower, osmorhiza, pink geranium, and violet. On sites where pinegrass, lupine, and wild strawberry were observed (constancy 80%) they were important in the understory.

Downed woody material (1540 kg/ha) and fuel heights (60 cm) were average (see Table 3).

Vertebrate Response to Community Types

Mammals

Tables 4 and 5 present summaries of mammal plot counts and the number of small mammals trapped or sighted in each community. Thirteen small mammal species were trapped with a community average of nine species. In addition, three species (badger, coyote, and porcupine) were observed in several communities (see Table 5).

Trends observed in plot count data indicate that red squirrel densities were highest in the Aspen-Lodgepole Pine Community. Northern pocket gophers appeared to select sites classed as Aspen/Snowberry and Aspen/Chokecherry. Trapping results support these observations (see Table 5). Snowshoe hare pellets were observed on 28% of the sampling units, but did not appear in the Aspen/Snowberry, Aspen/Chokecherry or Aspen-Douglas Fir/Grass Phase. This species appears to avoid aspen stands where conifer basal areas are extremely low or absent (see Tables 4, and 11 to 16).

Mule deer pellet groups were observed in 34% of the stands, however, these groups were not counted in the Aspen-Douglas Fir/Grass or Aspen-Alpine Fir/Grass Phases. Elk appeared to select Aspen/Chokecherry (constancy 100%) and Aspen-Alpine Fir/Grass (constancy 80%) stands. This species was not observed in the Aspen-Douglas Fir/Grass Phase. Moose demonstrated a preference for Aspen/Chokecherry stands and pellet groups were not counted in the Snowberry or Service Berry-Mountain Lover Phase.

The yellow pine chipmunk, northern pocket gopher, deer mouse, and boreal redback vole were the small mammals most frequently trapped.

Table 4. Summary of pellet groups, middens, and gopher mounds counted in each community type in the Soda Springs Ranger District, Idaho Study Area.

	Structures Counted/100 Plots						
Community Number[a]	1	2	3	4	5	6	
Total Plots	500	300	700	600	300	500	
Common Name							Overall Constancy[b]
Middens							
Red Squirrel	0.0	0.7	0.4	1.8	.	0.8	.
	.	(66)	(43)	(83)	.	(40)	(41)
Mounds							
Northern Pocket Gopher	5.9	5.0	0.9	1.7	3.0	1.8	.
	(100)	(100)	(71)	(83)	(100)	(60)	(83)
Pellet Groups							
Mule Deer	0.4	0.7	0.3	1.0	.	.	.
	(40)	(66)	(29)	(67)	.	.	(34)
Elk	0.8	1.3	0.1	0.3	.	1.6	.
	(60)	(100)	(29)	(33)	.	(80)	(45)
Moose	.	3.0	.	0.5	0.3	0.4	.
	.	(100)	.	(50)	(33)	(40)	(31)
Snowshoe Hare	.	.	0.4	1.0	.	1.0	.
	.	.	(29)	(50)	.	(60)	(28)

[a] Community numbers: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/ Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[b] Community constancy is the per cent of stands in which species was observed.

Table 5. Number of small mammals trapped in each community type, Soda Springs Ranger District, Idaho Study Area.

	Animals/1000 Trap Nights						
Community Number[a]	1	2	3	4	5	6	Mean No.
Trap Nights	1500	900	2100	1800	900	1500	Caught
Common Name							
Vagrant Shrew	4.0	1.1	0.5	0.6	.	0.7	1.2
	(80)[b]	(33)	(14)	(17)	.	(20)	(28)
Longtail Weasel	1.3	1.1	.	.	.	0.7	0.5
	(20)	(33)	.	.	.	(20)	(10)
Badger	.	.	*[c]	.	.	.	.
Coyote	.	.	.	*	*	.	.
Uinta Ground Squirrel	2.7	.	1.4	1.1	2.2	.	1.3
	(60)	.	(29)	(17)	(33)	.	(24)
Least Chipmunk	.	.	0.5	.	.	2.0	0.7
	.	.	(14)	.	.	(20)	(14)
Yellow Pine Chipmunk	5.3	2.2	5.7	7.8	2.2	2.0	4.5
	(60)	(66)	(71)	(83)	(33)	(40)	(55)
Red Squirrel	.	3.3	1.4	6.1	.	1.3	2.2
	.	(66)	(29)	(100)	.	(40)	(41)
Northern Flying Squirrel	1.3	.	1.4	1.7	.	.	0.9
	(20)	.	(29)	(50)	.	.	(21)
Northern Pocket Gopher	8.7	8.9	2.9	3.9	3.3	1.3	4.5
	(100)	(100)	(43)	(67)	(66)	(40)	(66)
Great Basin Pocket Mouse	2.0	1.1	1.4	.	.	0.7	0.9
	(20)	(33)	(29)	.	.	(20)	(14)
Deer Mouse	4.0	6.7	.	7.2	8.9	6.0	4.8
	(60)	(66)	.	(100)	(100)	(100)	(66)
Boreal Redback Vole	6.0	1.1	2.4	3.9	3.3	3.3	3.5
	(80)	(33)	(57)	(67)	(66)	(60)	(62)
Mountain Vole	2.0	.	.	.	.	.	0.3
	(60)	.	.	.	.	.	(10)
Western Jumping Mouse	2.0	2.2	0.5	1.1	.	2.0	1.3
	(40)	(66)	(14)	(33)	.	(60)	(34)
Porcupine	.	.	.	*	.	.	.

[a] Community numbers: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[b] Community constancy is the per cent of stands in which species was observed.

[c] Species observed but not trapped.

In addition, these species had the highest overall constancy values (see table 5).

Using number of individuals trapped as a density index, vagrant shrews, Uinta ground squirrels, boreal redback voles, and mountain voles preferred the Aspen/Snowberry Phases. Mountain voles were only trapped in this phase. Northern pocket gophers were most abundant in the Aspen/Chokecherry Phase. Yellow pine chipmunks were the most common species trapped in the Aspen/Service Berry-Mountain Lover Phase, however, the largest number of yellow pine chipmunks, red squirrels, and northern flying squirrels were caught in the Aspen-Lodgepole Pine Phase. With the exception of the Aspen/Service Berry-Mountain Lover Phase, deer mice preferred sites with higher conifer basal areas. The vagrant shrew, and Great Basin pocket mouse appeared to avoid coniferous phases. In addition, the density of northern pocket gophers was substantially lower among community phases with larger conifer stems.

Avian fauna

Forty bird species were observed in 29 stands (six community phases). Seven species appeared in more than 50% of the stands. Ten species were observed in 25 to 50% of the stands, and 23 species were counted in less than 25% of the stands (Table 6). In general, the average number of birds counted declined (from 14.5 to 7.5) as the number of coniferous trees increased. The mean number of birds counted was significantly higher in the Aspen/Snowberry ($\bar{X}$ = 16.0) and Aspen/Chokecherry ($\bar{X}$ = 11.9) Phases. The largest numbers of bird species were observed in the Aspen/Service Berry-Mountain Lover (28), Aspen-

Table 6. Number of birds counted in each community type, Soda Springs Ranger District, Idaho Study Area.

	Birds/4.5 hr of Observation						
Community Number[a]	1	2	3	4	5	6	
Total Hours Observed	22.5	13.5	31.5	27.0	13.5	22.5	
Common Name							CC[b]
Goshawk	.	.	.	0.2	.	0.4	10
	.	.	.	(17)[b]	.	(40)	.
Sharp-shinned Hawk	.	0.3	0.6	.	.	.	10
	.	(33)	(29)	.	.	.	.
Swainson's Hawk	.	.	.	.	0.3	.	3
	.	.	.	.	(33)	.	.
Blue Grouse	.	4.0	0.6	0.2	.	.	14
	.	(66)	(14)	(17)	.	.	.
Ruffed Grouse	4.4	.	0.6	.	.	0.2	24
	(60)	.	(43)	.	.	(20)	.
Sandhill Crane	.	.	.	.	2.0	.	7
	.	.	.	.	(66)	.	.
Great Horned Owl	1.4	1.0	0.7	.	.	0.2	17
	(40)	(33)	(14)	.	.	(20)	.
Broad-tailed Hummingbird	0.8	.	1.1	0.5	5.0	1.6	45
	(20)	.	(57)	(33)	(100)	(60)	.
Red-shafted Flicker	3.2	2.3	1.9	0.5	4.3	0.6	48
	(50)	(66)	(43)	(33)	(100)	(20)	.
Yellow-bellied Sapsucker	3.6	5.3	2.1	2.0	1.3	1.6	62
	(50)	(100)	(43)	(83)	(33)	(60)	.
Williamson's Sapsucker	.	.	1.1	0.2	.	1.0	24
	.	.	(43)	(17)	.	(60)	.
Hairy Woodpecker	.	.	2.3	0.8	.	0.4	21
	.	.	(43)	(17)	.	(40)	.
Downy Woodpecker	1.6	1.3	.	1.5	1.3	.	17
	(20)	(33)	.	(33)	(33)	.	.
Hammond's Flycatcher	1.0	2.7	1.6	0.7	0.3	.	34
	(20)	(66)	(71)	(17)	(33)	.	.
Olive-sided Flycatcher	1.8	.	1.4	0.8	1.3	1.6	45
	(40)	.	(43)	(50)	(66)	(60)	.
Western Wood Pewee	1.6	2.7	0.7	0.5	2.0	0.2	31
	(40)	(33)	(14)	(33)	(66)	(20)	.
Tree Swallow	6.0	7.7	1.9	0.5	2.0	0.2	66
	(80)	(66)	(57)	(33)	(100)	(60)	.

Table 6. Continued

	Birds/4.5 hr Observation						
Community Number[a]	1	2	3	4	5	6	
Total Hours Observed	22.5	13.5	31.5	27.0	13.5	22.5	
Common Name							CC[b]
Steller's Jay	.	.	.	.	.	0.4	3
	.	.	.	.	.	(20)	.
Gray Jay	.	1.0	.	0.3	.	.	10
	.	(33)	.	(33)	.	.	.
Common Crow	.	.	.	.	1.0	.	3
	.	.	.	.	(33)	.	.
Black-capped Chickadee	6.8	8.3	1.7	3.0	1.3	1.4	66
	(60)	(100)	(57)	(67)	(66)	(60)	.
Red-breasted Nuthatch	.	.	0.6	0.8	.	.	17
	.	.	(29)	(50)	.	.	.
House Wren	7.0	5.7	1.7	0.7	3.0	1.4	55
	(100)	(100)	(43)	(17)	(66)	(40)	.
Robin	6.2	3.0	2.3	2.8	5.7	2.8	76
	(100)	(66)	(43)	(83)	(100)	(80)	.
Hermit Thrush	.	.	0.9	0.7	.	1.4	21
	.	.	(29)	(17)	.	(60)	.
Mountain Bluebird	3.6	0.7	.	0.3	2.0	.	31
	(100)	(33)	.	(17)	(66)	.	.
Ruby-crowned Kinglet	.	.	1.0	0.2	.	1.4	17
	.	.	(29)	(17)	.	(40)	.
Warbling Vireo	6.2	4.7	2.0	1.8	3.7	1.8	72
	(100)	(100)	(57)	(50)	(100)	(60)	.
Yellow Warbler	2.2	.	.	.	.	1.0	17
	(60)	.	.	.	.	(40)	.
Audubon's Warbler	4.6	.	2.1	2.5	1.0	1.0	59
	(100)	.	(71)	(67)	(33)	(40)	.
MacGillivray's Warbler	0.2	0.3	.	.	.	.	7
	(20)	(33)	.	.	.	.	.
Western Tanager	.	.	1.9	1.3	0.3	1.4	45
	.	.	(71)	(67)	(33)	(60)	.
Black-headed Grosbeak	1.8	1.7	0.9	0.8	.	0.2	38
	(80)	(66)	(29)	(17)	.	(40)	.
Cassin's Finch	1.0	1.0	0.6	1.2	.	.	21
	(20)	(33)	(29)	(33)	.	.	.
Pine Siskin	.	.	3.1	1.7	.	1.8	30
	.	.	(71)	(50)	.	(40)	.
American Goldfinch	1.0	.	0.1	.	0.3	.	17
	(60)	.	(14)	.	(33)	.	.

Table 6. Continued

	Birds/4.5 hr Observation						
Community Number[a]	1	2	3	4	5	6	
Total Hours Observed	22.5	13.5	31.5	27.0	13.5	22.5	
Common Name							CC[b]
Vesper Sparrow	.	.	.	.	.	0.4	3
	.	.	.	.	.	(20)	.
Oregon Junco	4.0	.	1.1	2.7	.	0.4	48
	(80)	.	(29)	(83)	.	(40)	.
Chipping Sparrow	.	.	1.3	.	.	0.4	14
	.	.	(43)	.	.	(20)	.
White-crowned Sparrow	1.4	.	.	.	0.3	.	14
	(60)	.	.	.	(33)	.	.
Mean Number of Birds Counted	16.0	11.9	8.4	6.5	9.2	6.3	
	(2.3)[c]	(1.7)	(1.3)	(0.5)	(0.1)	(0.1)	

[a] Community numbers: 1. Aspen/Snowberry, 2. Aspen/Chokecherry, 3. Aspen/Service Berry-Mountain Lover, 4. Aspen-Lodgepole Pine, 5. Aspen-Douglas Fir/Grass, 6. Aspen-Alpine Fir/Grass.

[b] Community constancy is the per cent of stands in which species was observed.

[c] Standard error (s.e.).

Lodgepole Pine (27), and Aspen-Alpine Fir/Grass (26) Phases.

Swainson's hawks, sandhill cranes, Steller's jays, common crows, and vesper sparrows were observed in only one community type. Red-shafted flickers, yellow-bellied sapsuckers, western wood pewees, black-capped chickadees, robins, warbling vireos, tree swallows, and house wrens were counted in every community type. Western wood pewees, tree swallows, house wrens, robins, and warbling vireos were associated with the Aspen/Snowberry and Aspen/Chokecherry Community Phases. Community types characterized by invading conifers (Aspen/Service Berry-Mountain Lover, Aspen-Lodgepole Pine, and Aspen-Alpine Fir/Grass) were preferred by the Williamson's sapsucker, hairy woodpecker, hermit thrush, ruby-crowned kinglet, western tanager, and pine siskin.

The Aspen/Snowberry Phase was preferred by ruffed grouse, mountain bluebirds, Audubon's warbler, American goldfinch, and white-crowned sparrows. Blue grouse, yellow-bellied sapsuckers, and black-capped chickadees were most common in the Aspen/Chokecherry Phase. The small numbers of birds observed and low species composition in the Aspen-Lodgepole Pine Phase coincided with the phenomenon that this phase was not preferred by any species. Hairy woodpecker and pine siskin were common in the Aspen/Service Berry-Mountain Lover Phase. Steller's jays were observed only in the Aspen-Alpine Fir/Grass Phase, and the hermit thrush preferred this community type. Broad-tailed hummingbirds, red-shafted flickers, common crows, and sandhill cranes were most frequently observed in the Aspen-Douglas Fir/Grass Phase.

DISCUSSION

Mammal Response to Community Classifications

Layser (1974) has reviewed the basic ecological features of habitat classification from a silvicultural point of view. Basically, schemes of habitat classification attempt to separate large heterogeneous habitats into similar management units. From a practical viewpoint the system is most useful when the classification phases are recognizable in the field. In this connotation ecological units are expressed as management types. The significance of this tool in vertebrate management lies in determining the rate and proportional patterns at which vegetation mosaics can be altered through management practices.

Manipulation of habitat for a variety of plant and animal resources presents some obvious trade-offs. For example, the development of deer habitat by selected management practices is fairly well documented (Wallmo et al., 1972 and Terrel, 1973). However, trade-offs are more difficult to assess in the simulataneous management of several vertebrate species. Gill et al. (1975) suggested a numerical habitat type/wildlife relationship to overcome this difficulty. An example of this method is presented in Table 7.

The ratios calculated in Table 7 were derived from data presented in Table 4. When the ratios are expressed as preference indices, a relative community preference is depicted. For example, one would expect about 4.5 times as many red squirrels in the Aspen-Lodgepole

Table 7. Comparisons of red squirrel, northern pocket gopher, mule deer, elk, and moose ratios calculated from plot counts (Table 4).

	Comparative Squirrel Ratios (Numerator Phase)					
Divisor Phase (#)	4	6	2	3	1	5
Lodgepole Pine (4)	1.0	0.4	0.4	0.2	.	.
Alpine Fir/Grass (6)	2.3	1.0	0.9	0.5	.	.
Chokecherry (2)	2.6	1.1	1.0	0.6	.	.
Service Berry-Mt. Lover (3)	4.5	2.0	1.8	1.0	.	.
Snowberry (1)	.	.	.	.	.	.
Douglas Fir/Grass (5)	.	.	.	.	.	.
Total	10.4	4.5	4.1	2.3	0	0

	Comparative Gopher Ratios (Numerator Phase)					
Divisor Phase (#)	1	2	5	6	4	3
Snowberry (1)	1.0	0.9	0.5	0.3	0.3	0.2
Chokecherry (2)	1.2	1.0	0.6	0.4	0.3	0.2
Douglas Fir/Grass (5)	2.0	1.7	1.0	0.6	0.6	0.3
Alpine Fir/Grass (6)	3.3	2.8	1.7	1.0	0.9	0.5
Lodgepole Pine (4)	3.5	2.9	1.8	1.1	1.0	0.5
Service Berry-Mt. Lover(3)	6.6	5.6	3.3	2.0	1.9	1.0
Total	17.6	14.9	8.9	5.4	5.0	2.7

	Comparative Mule Deer Ratios (Numerator Phase)					
Divisor Phase (#)	4	2	1	3	5	6
Lodgepole Pine (4)	1.0	0.7	0.4	0.3	.	.
Chokecherry (2)	1.4	1.0	0.6	0.4	.	.
Snowberry (1)	2.5	1.8	1.0	0.8	.	.
Service Berry-Mt. Lover (3)	3.3	2.3	1.3	1.0	.	.
Douglas Fir/Grass (5)	.	.	.	.	.	.
Alpine Fir/Grass (6)	.	.	.	.	.	.
Total	8.2	5.8	3.3	2.5	0	0

	Comparative Elk Ratios (Numerator Phase)					
Divisor Phase (#)	6	2	1	4	3	5
Alpine Fir/Grass(6)	1.0	0.8	0.5	0.2	0.1	.
Chokecherry (2)	1.2	1.0	0.6	0.2	0.1	.
Snowberry (1)	2.0	1.6	1.0	0.4	0.1	.
Lodgepole Pine (4)	5.3	4.3	2.7	1.0	0.3	.
Service Berry-Mt. Lover (3)	16.0	13.0	8.0	3.0	1.0	.
Douglas Fir/Grass (5)	.	.	.	.	.	.
Total	25.5	20.7	12.8	4.8	1.6	0

Table 7. Continued

	Comparative Moose Ratios (Numerator Phase)					
Divisor Phase (#)	2	4	6	5	1	3
Chokecherry (2)	1.0	0.2	0.1	0.1	.	.
Lodgepole Pine (4)	6.0	1.0	0.8	0.6	.	.
Alpine Fir/Grass (6)	7.5	1.3	1.0	0.8	.	.
Douglas Fir/Grass (5)	10.0	1.7	1.3	1.0	.	.
Snowberry (1)	.	.	.	.	.	.
Service Berry-Mt. Lover (3)	.	.	.	.	.	.
Total	24.5	4.2	3.2	2.5	0	0

Pine Phase as compared to the Aspen/Service Berry-Mountain Lover Phase. Calculations using elk pellet groups indicate the elk use in Aspen-Alpine Fir and Aspen/Chokecherry is similar (ratios 1.0 and 1.2), while the predominate moose use occurs in the Aspen/Chokecherry Phase (ratios 7.5 and 1.0).

The ratio value range is a comparative index to the relative importance of community selection by that species. Large range values are indicators that community classifications contribute significantly to the explanation of variation in species densities across the habitat spectrum. For example, comparative ratio range values for elk (15.0) and red squirrel (3.5) suggest community classifications contribute more information about stand selection by elk than red squirrel stand selection. From ratios of this type some predictions about vertebrate densities can be made. Large scale conversions of Aspen-Alpine Fir/Grass Communities to Aspen/Snowberry would be beneficial to northern pocket gophers and detrimental to snowshoe hares and elk.

The premise that certain mammals exhibit some selection for community types has been substantiated by Thilenius (1972), Gill et al. (1975), Marcum (1975), and Winn (1976). In this study trapping density and constancy values suggest the following small mammals exhibit community preference: vagrant shrew (Aspen/Snowberry), red squirrel (Aspen-Lodgepole Pine), and northern pocket gopher (Aspen/Snowberry and Aspen/Chokecherry).

Avian Response to Community Classifications

As a forest changes from one seral stage to another, each stage favors an avian community. Tomoff (1974) reported that plant species composition among the desert shrub communities was a significant factor in regulating breeding bird densities. Resource manipulations which modify successional patterns can greatly modify the birds' species regime of an area. For example, management objectives directed at rapid overstory rotation will eliminate bird communities associated with the mature stages of a sere.

In this study the number of bird species observed among aspen communities varied from 18 to 28 (see Table 6). Salt (1957) observed 19 bird species among flatland aspen communities near Jackson Hole, Wyoming, which had similar understories and elevations to this study area. He also reports hillside aspen stands in that area had significantly few bird species (5 to 14). These stands were characterized by fewer shrubs and small numbers of understory species. The results of this study closely parallel those of Salt.

Comparisons of constancy values and mean number of birds counted with mammal data indicate that bird species were not as closely correlated to phase types. Seven bird species were considered closely associated with phase designations. Blue grouse and house wrens preferred the Aspen/Chokecherry Phase, however, house wrens were also abundant in the Aspen/Snowberry Phase. Ruffed grouse, mountain bluebirds, and Audubon's warblers demonstrated a preference for the Aspen/Snowberry Phase. Sandhill cranes and broad-tailed hummingbirds were

most prevalent in the Aspen-Douglas Fir/Grass Phase. Broad-tailed hummingbirds were possibly attracted to the abundant Indian paintbrush flowers of this community (see Tables 2 and 22). Sandhill cranes were observed on hilltop sites that provided good visibility toward the valley foraging areas. The Aspen-Douglas Fir/Grass type could provide loafing areas for sandhill cranes.

Community structure

While the classification of aspen stands into community types aids in the analysis of large amounts of data, stand structures provide insight into vertebrate variability within specific vegetation types. Deer mice and boreal redback voles respond to factors other than the dominant vegetation (Kirkland and Griffin, 1974). Winn (1976) reported among lodgepole pine communities, basal area and accumulated dead wood structures significantly modified the abundance of Uinta chipmunks, northern flying squirrels, snowshoe hare, deer mice, boreal redback voles, elk, and moose.

Community classifications based entirely on the distribution of plant species are not efficient predictors of bird abundance or species composition. Using discriminant function analysis, Anderson and Shugart (1974) demonstrated that some bird species are distributed according to specific habitat structures. Flack (1970) reported the number of bird species in Western North American aspen stands decreased as tree density increased. He reported the number of birds and bird species increase among stands with larger tree diameters. In addition Flack (1970) generalized that the number of woodpeckers increased as the average stem diameter exceeds 15 cm and tree densities

varied between 40 and 120 stem/ha. Whitmore (1975) suggested that percent canopy cover and shrub density were important variables in determining which birds occupied a stand. Cody (1974) concluded that avian community members co-exist by virtue of different feeding strategies. Kilgore (1971) supports this conclusion as he reports that selectively thinning the sapling layer greatly altered bird species composition by changing the stratification of feeding sites. Hooper et al. (1973) reported that the mean number of breeding pairs was correlated to percent understory. However, these observations do not indicate the response of specific bird species to the understory vegetation.

It appears that schemes to classify community types have useful implications when combined with community structures.

MAJOR RESEARCH FINDINGS AND RECOMMENDATIONS

Research finding. The stability of vertebrate populations can not be adequately estimated in one sampling season. As such, in this study, indexes used to compare vertebrate densities among community types assumed that the distribution of animals throughout the study area was independent of animal numbers.

Recommendation. Permanent sampling units should be established in areas of anticipated aspen manipulation and relative stable aspen communities to collect trend data on major vertebrate species.

Research finding. This study's plant community data is cursory in nature, however, within the study area it provides a baseline for developing meaningful descriptions of aspen habitat types.

Recommendation. Research endeavors to classify aspen communities into habitat types should be initiated to provide for longterm management of nongame wildlife species. Subsequent community descriptions should include community structures such as accumulations of downed woody material, understory biomass, and overstory canopy coverage.

Research finding. Bird species apparently are more reliant on community structures than flora patterns.

Recommendation. It is suggested that management options directed at predominately aspen communities include the development of structural diversities.

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APPENDIXES

Appendix A

Common and Scientific Names for Important Plant and Animal Species

(Tables 8 - 10)

Table 8. Common and genus names of major understory plant species found on the study area, Soda Springs Ranger District, Idaho.

Common Name	Genus[1]
Shrubs	
Chokecherry	*Prunus*
Currant	*Ribes*
Mountain Lover	*Pachystima*
Oregon Grape	*Berberis*
Rose	*Rosa*
Sagebrush	*Artemisia*
Serviceberry	*Amelanchier*
Snowberry	*Symphoricarpos*
Snowbush	*Ceanothus*
Thimble Berry	*Rubus*
Graminoids	
Alpine Timothy	*Phleum*
Bluebunch Fescue	*Festuca*
Needlegrass	*Stipa*
Nodding Brome	*Bromus*
Oniongrass	*Melica*
Pinegrass	*Calamagrostis*
Poa	*Poa*
Sedge	*Carex*
Timothy	*Phleum*
Wild Rye	*Elymus*
Forbs	
Aster	*Aster*
Bedstraw	*Galium*
Bog Orchid	*Habenaria*
Cinquefoil	*Potentilla*
Columbine	*Aquilegia*
Common Dandelion	*Taraxacum*
Coneflower	*Rubeckia*
Cow Parsnip	*Heracleum*
Everlasting	*Antennaria*
Fleabane	*Erigeron*
Goldenrod	*Solidago*
Hawkweed	*Hieracium*
Heartleaf Arnica	*Arnica*
Horse Mint	*Agastache*
Indian Paintbrush	*Castilleja*
Lupine	*Lupinus*
Meadow Rue	*Thalictrum*

Table 8. Continued

Common Name	Genus
Meadow Salsify	*Tragopogon*
Milkweed	*Asclepias*
Mountain Dandelion	*Agoseris*
Osmorhiza	*Osmorhiza*
Pedicularis	*Pedicularis*
Pink Geranium	*Geranium*
Sego Lily	*Calochortis*
Sunflower	*Helianthus*
Tall Larkspur	*Delphinium*
Thistle	*Cirsium*
Violet	*Viola*
Wild Strawberry	*Fragaria*
Yampa	*Periderida*
Yarrow	*Achillea*

1. Nomenclature follows Holmgren and Reveal (1966).

Table 9. Common and scientific names of mammals observed in study stands, Soda Springs Ranger District, Idaho.[a]

Common Name	Scientific Name
Vagrant Shrew	*Sorex vagrans*
Longtail Weasel	*Mustela frenata*
Badger	*Taxidae taxus*
Coyote	*Canis latrans*
Uinta Ground Squirrel	*Citellus armatus*
Least Chipmunk	*Eutamias minimus*
Yellow Pine Chipmunk	*Eutamias amoenus*
Red Squirrel	*Tamiasciurus hudsonicus*
Northern Flying Squirrel	*Glaucomys sabrinus*
Northern Pocket Gopher	*Thomomys talpoides*
Great Basin Pocket Mouse	*Perognathus parvus*
Deer Mouse	*Peromyscus maniculatus*
Boreal Redback Vole	*Clethrionomys gapperi*
Mountain Vole	*Microtus montanus*
Western Jumping Mouse	*Zapus princeps*
Porcupine	*Erethizon dorsatum*
Snowshoe Hare	*Lepus americanus*
Elk	*Cervus canadensis*
Mule Deer	*Odocoileus hemionus*
Moose	*Alces alces*

[a] Nomenclature follows Burt and Grossenheider (1964).

Table 10. Common and scientific names of birds observed in study stands, Soda Springs Ranger District, Idaho.[a]

Common Name	Scientific Name
Goshawk	*Accipiter gentilis*
Sharp-shinned Hawk	*Accipiter striatus*
Swainson's Hawk	*Bueto swainsoni*
Blue Grouse	*Dendragapus obscurus*
Ruffed Grouse	*Bonasa umbellus*
Sandhill Crane	*Grus canadensis*
Great Horned Owl	*Bubo virginianus*
Broad-tailed Hummingbird	*Selasphorus platycerus*
Red-shafted Flicker	*Colaptes cafer*
Yellow-bellied Sapsucker	*Sphrapicus varius*
Williamson's Sapsucker	*Sphrapicus thyroideus*
Hairy Woodpecker	*Dendrocopos villosus*
Downy Woodpecker	*Dendrocopos pubescens*
Hammond's Flycatcher	*Empidonax hammondii*
Olive-sided Flycatcher	*Nuttallornis borealis*
Western Wood Pewee	*Contopus sordidulus*
Tree Swallow	*Iridoprocne bicolor*
Steller's Jay	*Cyanocitta stelleri*
Gray Jay	*Perisoreus canadensis*
Common Crow	*Corvus corax*
Black-capped Chickadee	*Parus antricapillus*
Red-breasted Nuthatch	*Sitta canadensis*
House Wren	*Troglodytes aedon*
Robin	*Turdus migratorius*
Hermit Thrush	*Hylocichla guttata*
Mountain Bluebird	*Sialia currucoides*
Ruby-crowned Kinglet	*Regulus calendula*
Warbling Vireo	*Vireo gilvus*
Yellow Warbler	*Dendrocia petechia*
Audubon's Warbler	*Dendrocia auduboni*
MacGillivray's Warbler	*Oporornis tolmiei*
Western Tanager	*Piranga ludoviciana*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Cassin's Finch	*Carpodacus cassinii*
Pine Siskin	*Spinus pinus*
American Goldfinch	*Spinus tristis*
Vesper Sparrow	*Pooecetes gramineus*
Oregon Junco	*Junco oreganus*
Chipping Sparrow	*Spizella passerina*
White-crowned Sparrow	*Zonotrichia leucophrys*

[a] Nomenclature follows Burleigh (1972).

Appendix B

Stand Overstory Summaries

(Tables 11-16)

Mid-point class 3.6 cm includes seedlings 0.1 to 1.4 m tall. Number of stems are listed per 375 m^2 (0.093 acre).

Table 11. Overstory summaries for aspen dominated stands (Snowberry Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height)										Basal Area m^2/ha	
		3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Live	Dead
		Number of Stems											
S17	Aspen	.	1	6	9	8	6	3	.	.	1	26.4	6.3
S39	Aspen	123	.	1	1	8	2	4	2	1	1	27.5	3.1
S59	Aspen	29	6	6	6	1	1	5	1	2	1	24.8	2.9
S75	Aspen	.	6	4	5	9	4	3	4	1	.	29.5	5.6
S82	Aspen	35	.	5	6	3	3	4	3	1	1	26.9	3.4

Table 12. Overstory summaries for aspen dominated stands (Chokecherry Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height) 3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Basal Area m^2/ha Live	Dead
		Number of Stems											
S10	Aspen	7	2	.	.	3	.	.	3	1	1	12.7	5.9
	Douglas Fir	.	.	.	2	.	.	.	.	.	.	1.1	.
S42	Aspen	6	6	3	4	4	.	.	3	1	.	15.1	7.8
S84	Aspen	11	.	.	1	2	.	.	4	.	2	14.1	6.8
	Douglas Fir	.	.	1	1	.	.	.	.	.	.	0.9	.

Table 13. Overstory summaries for aspen dominated stands (Service Berry-Mountain Lover Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height) 3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Basal Area m^2/ha Live	Dead
		Number of Stems											
S13	Aspen	.	2	24	22	7	3	.	.	.	.	30.3	2.1
	Douglas Fir	5	.	.	.	.	.	.	.	.	.	0.2	.
S19	Aspen	3	.	18	16	16	.	.	.	.	.	28.3	2.8
	Douglas Fir	8	.	.	.	.	.	.	.	.	.	0.3	.
S48	Aspen	6	.	.	.	4	4	5	3	.	.	19.2	4.0
	Douglas Fir	19	2	1	2	1	2	2	.	1	1	12.7	.
S55	Aspen	10	.	.	3	17	8	3	1	.	.	29.4	.
	Douglas Fir	10	5	1	1	1	.	1	.	.	.	4.6	.
S57	Aspen	10	.	.	.	3	4	7	.	2	1	22.8	.
	Douglas Fir	11	.	.	2	.	.	3	2	.	.	8.9	.
S62	Aspen	16	.	.	1	4	2	3	2	3	.	20.3	.
	Douglas Fir	21	.	.	1	1	2	1	.	.	1	8.1	.
S64	Aspen	4	.	12	22	10	4	.	.	.	.	28.9	2.9
	Douglas Fir	13	.	.	.	.	.	.	.	.	.	0.5	.

Table 14. Overstory summaries for aspen dominated stands (Lodgepole Pine Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height) 3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Basal Area m^2/ha Live	Dead
		Number of Stems											
S15	Aspen	54	2	2	10	10	7	1	1	1	.	29.1	.
	Lodgepole Pine	6	.	.	.	.	1	.	1	.	1	5.4	.
S31	Aspen	22	.	7	3	1	.	1	1	4	4	26.9	1.7
	Lodgepole Pine	9	.	.	.	.	2	.	.	.	1	4.9	.
	Douglas Fir	18	.	.	.	.	.	.	.	.	.	0.7	.
S38	Aspen	32	.	.	.	1	1	2	4	.	7	29.6	2.0
	Lodgepole Pine	2	.	.	.	1	.	1	1	.	.	3.9	.
	Douglas Fir	2	.	.	.	.	.	.	.	.	.	0.1	.
S40	Aspen	40	3	11	9	6	1	.	.	1	.	19.2	1.1
	Lodgepole Pine	1	.	.	.	.	.	.	.	.	1	2.5	.
	Douglas Fir	8	.	.	.	.	.	.	.	.	.	0.3	.
S68	Aspen	36	.	2	4	4	3	5	3	.	3	29.7	1.6
	Lodgepole Pine	2	.	.	.	.	.	.	.	1	.	2.1	.
S79	Aspen	39	1	3	2	4	2	1	.	1	3	19.9	1.0
	Lodgepole Pine	2	.	2	.	.	.	.	1	.	1	4.9	0.8
	Douglas Fir	2	.	.	.	.	.	.	.	.	.	0.1	.

Table 15. Overstory summaries for aspen dominated stands with Douglas fir (Aspen/Grass Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height) 3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Basal Area m^2/ha Live	Dead
		Number of Stems											
S16	Aspen	9	1	4	4	1	3	3	4	.	1	21.3	0.9
	Douglas Fir	.	.	.	1	.	.	.	.	.	.	0.6	.
S60	Aspen	7	1	.	2	2	1	3	2	2	2	20.5	1.2
	Douglas Fir	.	.	.	2	.	.	.	.	.	.	1.1	.
S97	Aspen	7	2	4	11	9	4	2	2	.	.	25.6	3.9
	Douglas Fir	15	.	1	.	.	.	.	.	.	.	1.0	.

Table 16. Overstory summaries for aspen dominated stands with alpine fir (Aspen/Grass Phase) in the Soda Springs Ranger District, Idaho Study Area.

Stand	Species	Midpoint Diameter Class (cm at breast height) 3.6	8.5	10.9	13.3	15.8	18.2	20.6	23.0	25.5	27.9	Basal Area m^2/ha Live	Dead
		Number of Stems											
S22	Aspen	1	.	2	8	17	8	2	4	.	.	36.2	
	Alpine Fir	34	1	.	.	.	.	2	.	.	.	5.1	.
S71	Aspen	.	.	1	11	7	13	3	2	1	.	34.9	.
	Alpine Fir	9	2	1	1	1	2	.	.	.	.	4.6	.
S80	Aspen	3	7	13	7	4	8	4	1	2	2	37.9	0.6
	Alpine Fir	19	2	2	2	1	.	.	.	1	.	5.9	.
S88	Aspen	5	.	.	1	3	9	5	3	4	2	37.2	.
	Alpine Fir	1	.	.	1	.	.	2	.	.	.	3.3	.
S89	Aspen	5	.	1	2	12	8	.	2	1	3	32.1	.
	Alpine Fir	31	.	.	.	.	1	.	1	.	1	6.4	.

Appendix C

Stand, Aspect, Slope, and Understory Vegetation

(Tables 17 - 22)

Number on left of colon represents community constancy.

Number on right of colon is average understory canopy coverage class.

Definition of understory canopy coverage

% Canopy Coverage	0%	1%	5%	15%	25%		50%
Representation	Absent	Trace	Common	Well	Abundant		
Coverage Class		1	2	3	4	5	6

Table 17. Aspect, slope, and percent canopy coverage of major understory species in Aspen (Snowberry Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number					
	S17	S39	S59	S75	S82	
Aspect	SW	W	NW	SW	NW	
Slope %	25	25	25	25	10	
	Stand Understory Vegetation[1]					
Species						Community Constancy[2]
Shrubs						
Chokecherry	.	.	1	3	.	40:2
Oregon Grape	.	1	1	.	.	40:1
Rose	3	.	.	.	2	40:2
Service Berry	.	2	3	.	.	40:1
Snowberry	6	3	3	6	6	100:5
Graminoids						
Alpine Timothy	.	1	1	.	.	40:1
Bluebunch Fescue	1	.	1	.	.	40:1
Needlegrass	3	.	.	5	.	40:3
Nodding Brome	4	4	4	4	3	100:4
Poa	3	1	2	3	4	100:3
Sedge	4	2	2	3	.	80:3
Wild Rye	.	4	2	.	.	40:2
Forbs						
Bedstraw	1	.	3	.	2	60:2
Bog Orchid	.	.	1	.	.	20:1
Cinquefoil	3	2	2	2	2	100:2
Common Dandelion	2	1	2	2	2	100:2
Everlasting	.	.	1	.	.	20:1
Goldenrod	3	.	.	2	2	60:2
Horsemint	3	1	1	3	2	100:2
Indian Paintbrush	.	.	1	1	.	20:1
Lupine	.	5	2	.	.	40:3
Meadow Rue	3	2	2	3	3	100:3
Mountain Dandelion	.	1	.	.	.	20:1
Osmorhiza	3	2	2	3	3	100:3
Pink Geranium	3	2	3	3	3	100:2
Violet	3	.	2	3	3	80:2
Wild Strawberry	.	.	.	.	4	20:2
Yarrow	3	2	2	2	2	100:2
No. of Species	17	17	23	16	15	

[1] Percent canopy coverage class.
[2] The value left of the dot represents community constancy. The mean community canopy coverage is right of the colon.

Table 18. Aspect, slope, and percent canopy coverage of major understory species in Aspen (Chokecherry Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number			
	S10	S42	S84	
Aspect	SE	SW	SE	
Slope %	35	25	30	
Species	Stand Understory Vegetation[1]			Community Constancy[2]
Shrubs				
Chokecherry	6	6	6	100:6
Current	2	.	2	66:1
Oregon Grape	.	1	.	33:1
Rose	2	3	2	100:2
Snowberry	2	1	3	100:2
Thimble Berry	1	.	1	66:1
Graminoids				
Needlegrass	.	3	.	33:2
Nodding Brome	3	2	3	100:3
Poa	4	4	3	100:3
Sedge	3	1	3	100:2
Wild Rye	3	.	3	66:3
Forbs				
Cinquefoil	1	.	1	66:1
Common Dandelion	.	1	.	33:1
Coneflower	3	.	4	66:3
Fleabane	1	.	2	66:2
Goldenrod	1	1	1	100:1
Heartleaf Arnica	3	.	1	66:2
Horsemint	2	3	1	100:2
Meadow Rue	2	4	2	100:3
Meadow Salsify	1	.	2	66:1
Milkweed	1	.	1	66:1
Osmorhiza	1	3	1	100:3
Pink Geranium	2	4	3	100:3
Sunflower	1	.	3	66:2
Tall Larkspur	.	1	.	33:1
Wild Strawberry	3	4	3	100:3
Yampa	1	.	1	66:1
Yarrow	1	1	1	100:1
No. of Species	24	17	24	28

[1] Percent canopy coverage class.
[2] The value left of the colon represents community constancy. The mean community canopy coverage is right of the colon.

Table 19. Aspect, slope, and percent canopy coverage of major understory species in Aspen (Service Berry-Mountain Lover Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number							
	S13	S19	S48	S55	S57	S62	S64	
Aspect	E	NE	N	N	NW	NW	E	
Slope %	35	35	10	25	25	20	30	
Species	Stand Understory Vegetation[1]							Community Constancy[2]
Shrubs								
Mountain Lover	5	4	4	5	4	5	5	100:4
Oregon Grape	2	.	.	.	.	2	2	43:1
Rose	3	3	2	2	3	2	3	100:2
Service Berry	5	5	5	5	4	3	5	100:5
Snowberry	2	2	1	.	.	3	2	71:2
Snow Brush	2	2	1	2	2	1	3	100:2
Graminoids								
Bluebunch Fescue	.	.	.	.	1	1	.	29:1
Needlegrass	3	3	.	.	.	.	2	43:2
Nodding Brome	.	.	2	.	2	.	.	29:1
Pinegrass	4	4	2	5	.	.	4	71:3
Poa	3	2	3	.	2	.	2	71:2
Wild Rye	.	.	4	.	.	5	.	29:3
Forbs								
Aster	.	2	.	2	.	.	.	29:2
Bedstraw	2	2	2	.	2	3	2	29:1
Bog Orchid	2	2	.	1	2	2	2	86:2
Cinquefoil	.	.	2	2	3	3	.	86:1
Columbine	.	2	.	2	.	.	.	29:1
Common Dandelion	2	3	2	2	.	3	3	86:2
Cow Parsnip	.	.	2	.	.	2	.	29:1
Everlasting	.	.	1	.	1	2	.	43:1
Hawkweed	.	2	.	1	.	.	2	43:1
Indian Paintbrush	2	2	2	.	2	2	2	86:2
Lupine	3	3	2	2	2	2	2	100:2
Meadow Rue	2	3	2	2	3	3	3	100:3
Mountain Dandelion	.	2	.	.	.	.	.	14:1
Osmorhiza	3	3	2	3	2	3	3	100:3
Pink Geranium	4	3	3	4	5	3	3	100:3

Table 19. Continued

	Stand Number						
	S13	S19	S48	S55	S57	S62	S64
Aspect	E	NE	N	N	NW	NW	E
Slope %	35	35	10	25	25	20	30
Stand Understory Vegetation[1]							
Species							Community Constancy[2]
Violet	.	.	.	.	2	2	.	29:1
Wild Strawberry	.	.	.	2	4	3	2	43:2
Yampa	2	.	.	.	.	.	2	29:1
Yarrow	2	2	2	2	2	2	2	100:2
No. of Species	19	21	20	17	19	22	21	31

[1] Percent canopy coverage class.

[2] The value left of the colon represents community constancy. The mean community canopy coverage is right of the dot. (community constancy:canopy coverage class).

Table 20. Aspect, slope, and percent canopy coverage of major understory species in Aspen (Lodgepole Pine Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number						
	S15	S31	S38	S40	S68	S79	
Aspect	SE	SE	SE	SE	SE	SE	
Slope %	20	15	20	20	15	15	
	Stand Understory Vegetation[1]						
Species							Community Constancy[2]
Shrubs							
Chokecherry	3	.	.	.	.	.	17:1
Mountain Lover	3	.	2	2	.	.	50:2
Wild Rose	2	.	.	2	2	.	50:1
Snowberry	3	3	2	2	3	3	100:3
Snow Brush	4	.	2	4	2	3	83:3
Thimble Berry	.	.	.	.	2	2	34:1
Graminoids							
Needlegrass	.	.	.	.	3	.	17:1
Nodding Brome	.	3	3	.	.	.	34:2
Oniongrass	.	.	.	.	3	.	17:1
Pinegrass	5	5	5	6	6	6	100:5
Poa	2	3	3	.	.	.	50:2
Sedge	3	3	4	.	2	3	83:2
Wild Rye	3	.	.	3	.	3	50:2
Forbs							
Aster	.	2	2	3	.	2	75:2
Bedstraw	4	2	.	2	2	.	75:2
Bog Orchid	.	.	2	2	2	2	75:1
Cinquefoil	.	.	.	2	.	.	17:1
Fleabane	2	.	.	2	.	.	34:1
Hawkweed	.	.	.	.	2	.	17:1
Heartleaf Arnica	.	5	4	4	3	3	83:3
Horsemint	2	.	.	.	.	.	17:1
Indian Paintbrush	3	2	2	.	.	.	50:2
Lupine	4	3	3	4	4	4	100:3
Meadow Rue	.	2	3	3	.	2	75:2
Mountain Dandelion	.	.	2	.	.	2	34:1
Osmorhiza	3	2	2	3	3	3	100:2
Pedicularis	.	2	2	.	2	2	75:1

Table 20. Continued

	Stand Number						
	S15	S31	S38	S40	S68	S79	
Aspect	SE	SE	SE	SE	SE	SE	
Slope %	20	15	20	20	15	15	
Species	Stand Understory Vegetation[1]						Community Constancy[2]
Pink Geranium	4	3	3	4	3	3	100:3
Sego Lily	.	.	.	.	2	2	34:1
Tall Larkspur	.	2	2	.	.	.	34:1
Thistle	.	2	.	.	.	.	17:1
Violet	.	.	.	.	2	.	17:1
Wild Strawberry	4	3	2	3	3	4	100:3
Yampa	.	.	.	.	2	2	34:1
Yarrow	2	3	2	2	2	2	100:2
No. Of Species	18	18	20	18	21	19	35

[1] Percent canopy coverage class.

[2] The value left of the colon represents community constancy. The mean community canopy coverage is right of the colon.

Table 21. Aspect, slope, and percent canopy coverage of major understory species in Aspen (Douglas Fir/Grass Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number			
	S16	S60	S97	
Aspect	NE	NE	SW	
Slope %	20	25	20	
Species	Stand Understory Vegetation[1]			Community Constancy[2]
Shrubs				
Rose	.	.	3	33:2
Snowberry	1	1	1	100:1
Graminoids				
Alpine Timothy	3	.	.	33:2
Bluebunch Fescue	2	.	1	66:2
Needlegrass	.	.	4	33:3
Nodding Brome	2	3	4	100:3
Poa	2	3	1	100:3
Sedge	2	.	.	33:1
Timothy	4	3	.	66:3
Wild Rye	3	5	2	100:3
Forbs				
Bedstraw	2	1	1	100:1
Cinquefoil	4	3	3	100:3
Common Dandelion	2	1	2	100:2
Everlasting	1	1	1	100:1
Horsemint	.	.	2	33:1
Indian Paintbrush	4	3	3	100:3
Lupine	2	3	3	100:2
Meadow Rue	1	3	1	100:2
Osmorhiza	2	1	2	100:2
Pedicularis	.	1	1	66:1
Pink Geranium	3	3	4	100:3
Violet	3	1	1	100:2
Wild Strawberry	1	3	1	100:2
Yarrow	2	1	1	100:2
No. of Species	20	18	21	24

[1] Percent canopy coverage class.

[2] The value left of the colon represents community constancy. The mean community canopy coverage is right of the colon.

Table 22. Aspect, slope and percent canopy coverage of major understory species in Aspen (Alpine Fir/Grass Phase) Communities in the Soda Springs Ranger District, Idaho Study Area.

	Stand Number					
	S22	S71	S80	S88	S89	
Aspect	SW	SW	SW	SW	SW	
Slope %	25	30	30	30	25	
Species	Stand Understory Vegetation[1]					Community Constancy[2]
Shrubs						
Current	.	.	2	.	.	20:1
Mountain Lover	2	2	1	1	1	100:1
Rose	.	.	2	.	1	60:1
Sagebrush	.	.	1	.	.	20:1
Snowberry	2	1	2	1	2	100:2
Snow Brush	1	3	.	.	.	40:2
Thimble Berry	2	1	.	.	.	40:2
Graminoids						
Needlegrass	2	3	3	4	4	100:3
Nodding Brome	4	5	2	5	4	100:5
Oniongrass	.	.	2	.	.	20:1
Pinegrass	4	.	3	2	5	80:3
Poa	2	2	2	2	2	100:2
Sedge	5	5	5	3	3	100:3
Wild Rye	5	3	2	3	3	100:3
Forbs						
Aster	2	.	2	.	.	40:1
Bedstraw	2	.	.	.	1	40:1
Bog Orchid	1	1	.	.	.	40:1
Cinquefoil	1	1	3	1	2	100:2
Columbine	.	.	.	2	2	40:1
Common Dandelion	1	3	1	1	1	100:2
Coneflower	3	5	3	5	3	100:4
Cow Parsnip	.	.	.	3	3	40:2
Fleabane	.	3	.	1	.	40:1
Hawkweed	.	1	.	.	.	20:1
Heartleaf Arnica	2	.	.	.	1	40.1
Horsemint	1	2	1	3	3	100:2
Indian Paintbrush	3	3	.	.	1	60:2
Lupine	3	.	2	2	5	80:3
Meadow Rue	1	3	2	1	3	100:3
Mountain Dandelion	.	1	.	.	1	40:1

Table 22. Continued

	Stand Number					
	S22	S71	S80	S88	S89	
Aspect	SW	SW	SW	SW	SW	
Slope %	25	30	30	30	25	
Species	Stand Understory Vegetation[1]					Community Constancy[2]
Osmorhiza	3	3	2	2	1	100:2
Pedicularis	1	.	.	.	.	20:1
Pink Geranium	5	5	5	3	5	100:5
Sunflower	3	.	2	.	.	40:2
Tall Larkspur	1	3	1	3	.	80:2
Violet	3	3	2	3	2	100:3
Wild Strawberry	1	5	.	5	5	80:3
Yarrow	2	.	2	2	1	80:2
No. of Species	29	24	25	23	26	38

[1] Percent canopy coverage class.

[2] The value left of the colon represents community constancy. The mean community canopy coverage is right of the colon.