APPENDIX C

BUCKSKIN VEGETATION RESULTS: 2003 FIELD SEASON

Plant Cover (Daubenmire):

The modified Daubenmire frames capture cover for all vegetation layers but because of their small size are best designed to evaluate understory herbaceous plant cover. The average cover of each species and ground cover category were averaged at each site based on the 20 quadrats sampled. Data were also grouped into larger categories to summarize categories or species that had small percentages individually but were important collectively in the role they play in the plant community. Examples of this included low percentages of herbaceous species (grasses and forbs) that were grouped into the category "Understory" and biological soil crust functional groups that were grouped into the category "Soil Crust". Cover data was also averaged across all sagebrush sites and all pinyon-juniper sites to generate landscape level summaries.

Sagebrush Cover Type

Common cover categories summarized for the sagebrush sites included the amount of live sagebrush, dead sagebrush, understory, bare ground, soil crusts, litter, and rock (Figure 1). Bare ground had the greatest cover percentage with an average of 33% (SE= 1.2, s^2 =26.6) across all sagebrush sites. Litter had the second highest percentage with an average cover of 23% (SE=1.3 5.6, s^2 =31.9). Rock cover averaged 13% (SE=0.60, s^2 =7.2) and biological soil crust cover averaged 12% (SE=0.32, s^2=2.1). The amount of live sagebrush (*Artemisia tridentata*) cover (6%, SE=0.82, s^2 =13.4) was slightly higher than the amount of dead sagebrush cover (4%, SE= 0.50, s^2=5.0). The combined understory of herbaceous species was the lowest category at 1% (SE=0.12, s^2=0.27). Vascular species richness, or the total number of species observed in sample frames, ranged from two to 12 species. The average species richness across sagebrush sites was 6.9 species (SE=0.62, s^2=6.2). This reflects the total number of species observed in sample frames and is not a complete count of plants in the larger plot area.

Pinyon-Juniper Cover Type

Common cover categories summarized for the pinyon-juniper sites included the amount of live sagebrush, dead sagebrush, understory, bare ground, soil crusts, litter, and rock (Figure 1) (Species Codes are found in Appendix A). As with the sagebrush cover type, ground cover categories had the highest percent cover with litter cover the highest (37%, SE=1.7, s^2=54.5). Rock had an average of 28% across pinyon-juniper sites (SE=1.6, s^2=51.2) and bare ground was slightly less at 27% average cover (SE=1.2, s^2=27.2). Overall, rock cover was much higher in the pinyon-juniper sites as a result of the granitic soils where the cover type was most abundant. Litter cover was also higher in the pinyon-juniper sites as a result of the large amount of needle duff found under juniper (*Juniperus osteosperma*) trees. Biological soil crusts had lower cover in the pinyon-juniper sites than the sagebrush sites with 8% average cover (SE=0.28, s^2=54.5). Dead sagebrush had slightly higher cover (4%, SE=0.37, s^2=2.7) than live sagebrush (3%, SE=0.65, s^2=8.5), a reversal of the relationship between dead and live sagebrush in the sagebrush cover type. It is possible that the shallow soils in the pinyon-juniper sites

exacerbated the effects of drought on sagebrush, resulting in higher mortality than in the deeper sagebrush site soils. Herbaceous understory cover averaged 1% (SE=0.12, s^2=0.27) which is consistent with the amount observed in the sagebrush cover type. Vascular species richness, or the total number of species observed in sample frames, ranged from one to 13 species. The average species richness across pinyon-juniper sites was 6.3 species (SE=0.67, s^2=9.4). Species richness varied little between sagebrush and pinyon-juniper cover types.

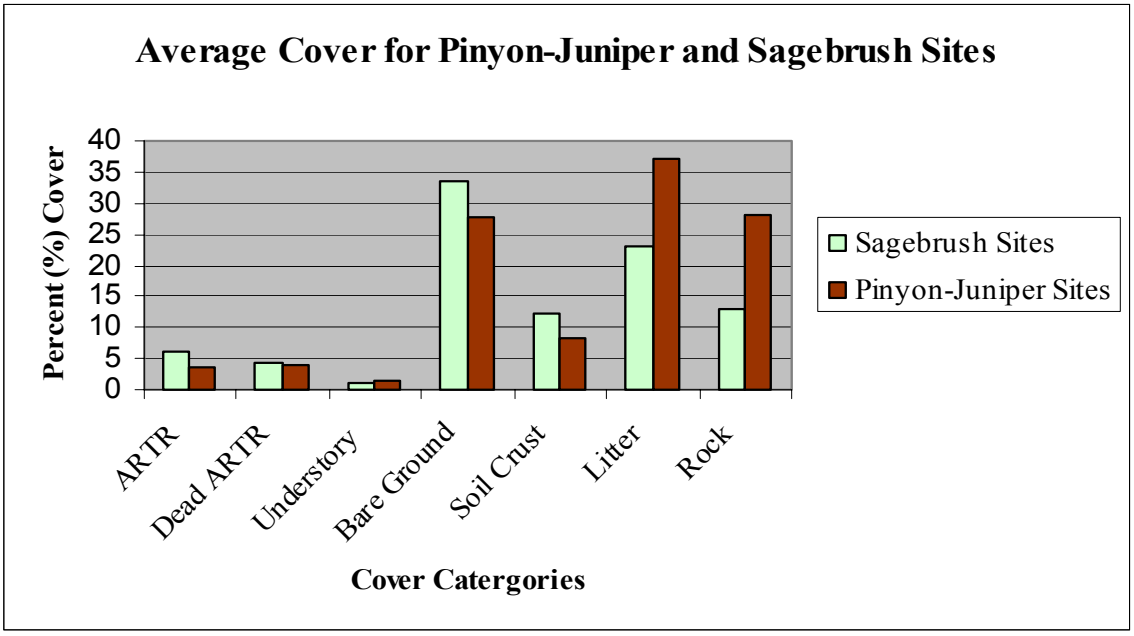

Figure 1. Average percent cover for selected cover categories at sagebrush and pinyon-juniper sites on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

Tree Density, Age Class, and Size:

Data from the 50 x 20 meter (m) tree plot were summarized as the total number of trees per plot, average number of trees across the cover type, and average number of trees per acre and per hectare (Table 1). Density counts on the plot and cover type level reflect a complete count of trees present and not an estimate. The number of trees per acre and per hectare are extrapolations based on densities observed in the 50 x 20 m tree plots.

Density

The average number of trees per plot in sagebrush sites was 12 trees compared to 54 trees per plot in pinyon-juniper sites (Table 1). This converts to approximately 47 trees per acre in sagebrush sites and 221 trees per acre in pinyon-juniper sites. Generally, juniper trees accounted for most of the tree density in the sagebrush sites with the composition more mixed in the pinyon-juniper sites. Approximately 45 trees per acre were juniper and two trees per acre were pinyon (*Pinus edulis*) in the sagebrush cover type. In the

pinyon-juniper sites we estimated an average of 118 junipers and 86 pinyon, and 17 Gambel's Oak (*Quercus gambellii*) per acre.

Table 1. Total Tree Density in Sagebrush and Pinyon-Juniper Sites

	Total # Trees	Avg. # trees per Plot	Avg. # Trees per Acre	Avg. # Trees per hectare
Sagebrush Sites	200	12	47	116
Pinyon-Juniper Sites	1144	54	221	545

Age Class

Juniper trees were most abundant in the young and mature age classes in both the sagebrush and pinyon-juniper cover types (Figure 2). Dead and decadent junipers were the least common of age classes. This suggests that the stand is in an early to mid-seral stage. Seedling and young age classes were the most common for pinyon trees in both cover types (Figure 3). However, for sagebrush cover types young pinyon trees were most common and seedling pinyon were most common in pinyon-juniper cover types. Decadent and dead pinyon were the least common age class for pinyon and showed lower densities overall than juniper trees in those age classes. Pinyon trees appear to be in an early seral stage in respect to age structure in both cover types.

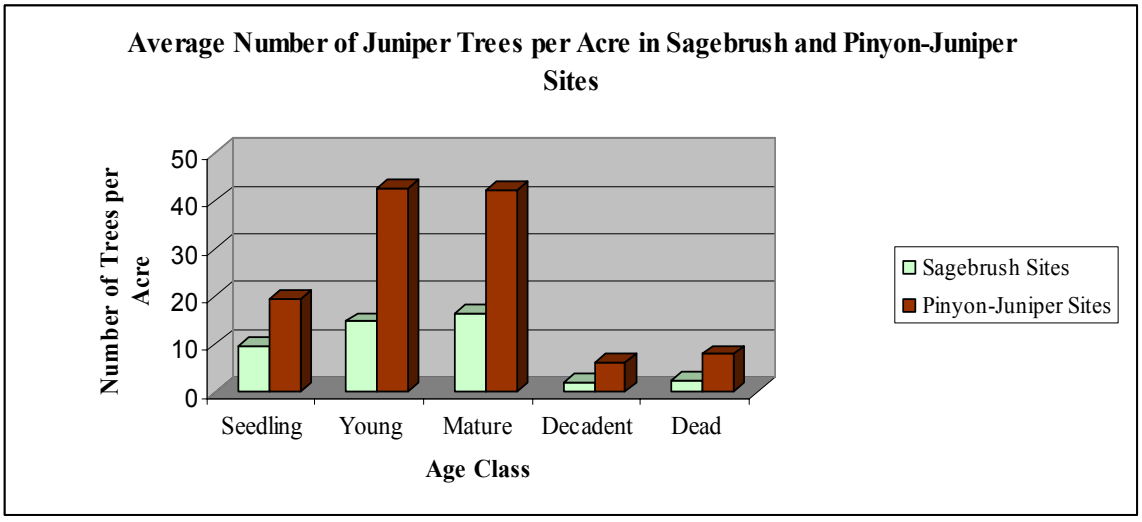

Figure 2. Juniper density in both sagebrush and pinyon-juniper cover types on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

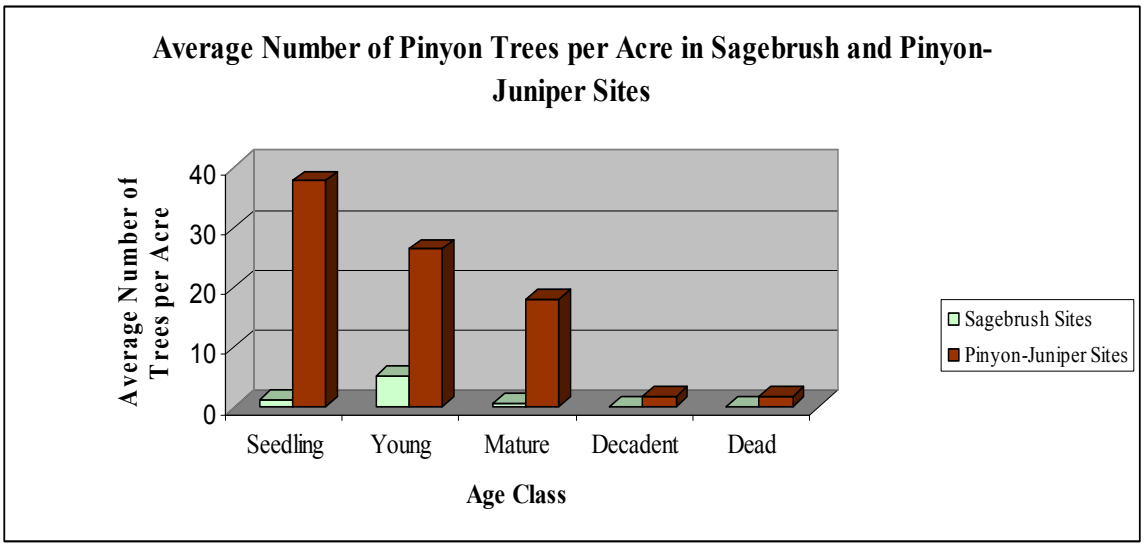

Figure 3. Pinyon density in both sagebrush and pinyon-juniper cover types on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

Size

Juniper trees tended on average to have a larger diameter at root crown (DRC) in pinyon-juniper cover types than in sagebrush cover types (Figure 4). Junipers in the pinyon-juniper cover type are likely older trees that have not been subjected to juniper management activities that typically occur in sagebrush cover types, such as chaining and mechanical thinning. In contrast, pinyon trees showed only slightly greater diameter at breast height (DBH) in pinyon-juniper cover types compared to sagebrush cover types. This may reflect the relatively higher proportion of seedling and young individuals in the pinyon-juniper cover types compared to the sagebrush cover type where age structure was more even (Figure 3).

In sagebrush cover types, the greatest juniper DRC was attained in the decadent age class with dead and mature trees close in size to the decadent trees (Figure 5). The similarity in DRC for junipers between the mature and dead/decadent categories may indicate that many mature trees are close to attaining decadence. It is also possible that size in terms of DRC is not directly attributable to age class for junipers because of the complex branching that often occurs at the base of the trees. Pinyon trees were only found in two age classes in the sagebrush cover type, young and mature (Figure 6). The mature age class showed the greatest average DBH and stronger contrast with the young age class than was observed for juniper trees. Also, average DBH of mature pinyon trees was greater in sagebrush cover types than in pinyon-juniper cover types (Figure 8). This may be a result of lowered competition from other trees such as junipers or possibly the deeper soils found in the sagebrush cover type.

In the pinyon-juniper cover type, juniper DRC followed a similar pattern to junipers in the sagebrush cover type (Figure 7). However, the mature age class had the largest DRC values on average compared to the sagebrush junipers where decadent trees were on

average larger. Large differences in size between the age classes were not apparent and this combined with the irregular basal growth of junipers precludes any strong conclusions about size and age class in these two cover types. Pinyon trees in the pinyon-juniper cover type showed greatest size in the mature age class, closely followed by the dead age class. Young trees had roughly the same DBH as the sagebrush cover type but mature trees were on average smaller than in the sagebrush cover type. Increased competition with other trees and shallower soil may be limiting the DBH of pinyon trees in the pinyon-juniper cover type relative to the sagebrush cover type.

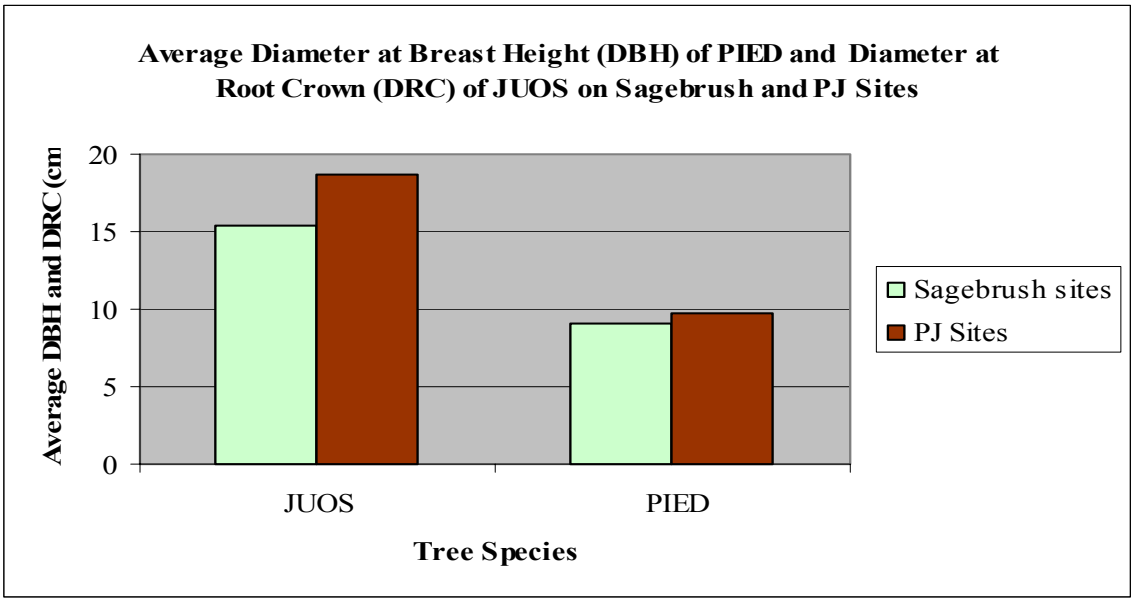

Figure 4. Tree size of juniper and pinyon on both sagebrush and pinyon-juniper sites on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

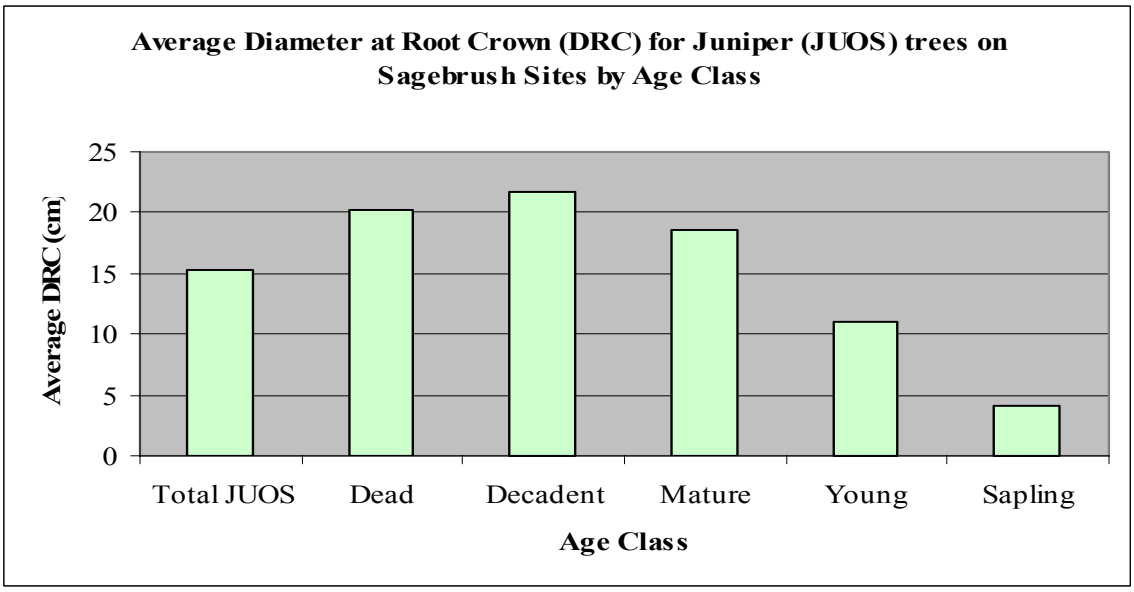

Figure 5. Age class structure and average diameter at root crown (DRC) for juniper trees in the sagebrush cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

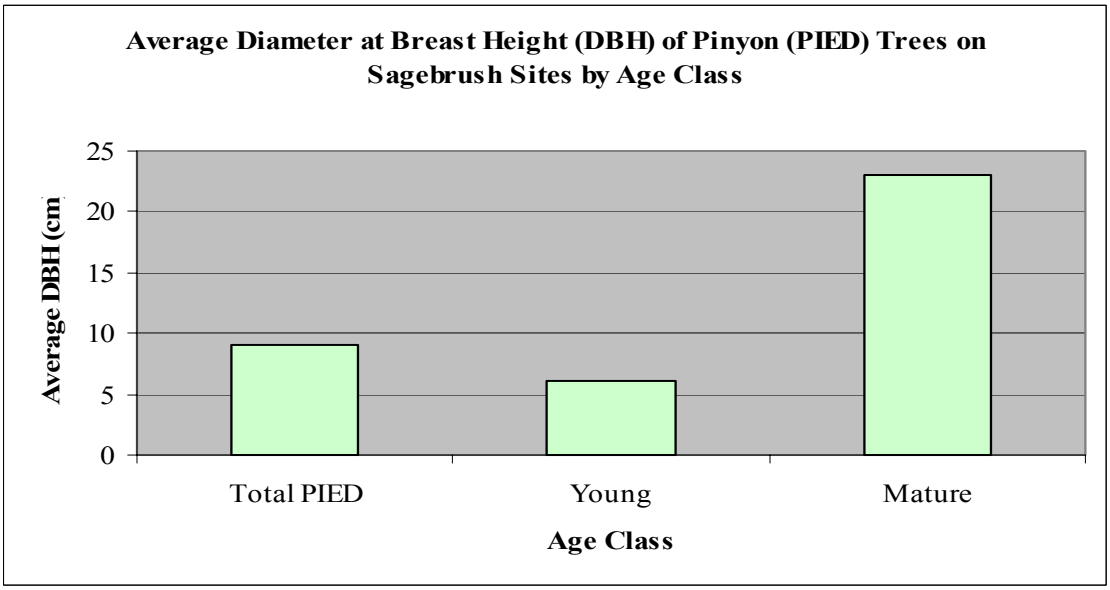

Figure 6. Age class structure and average diameter at breast height (DBH) for pinyon trees in the sagebrush cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

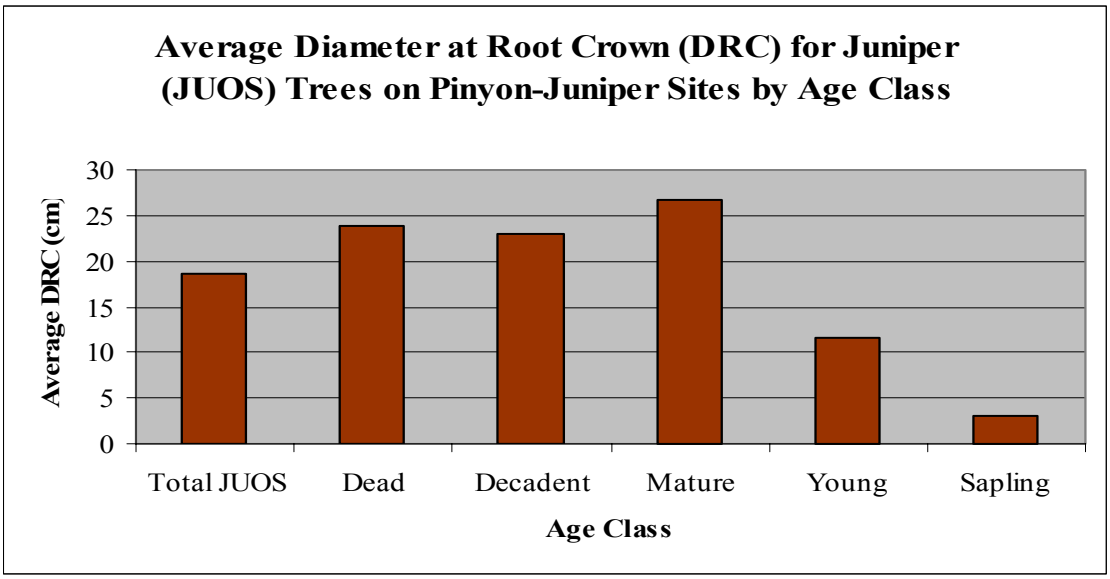

Figure 7. Age class structure and average diameter at root crown for juniper trees in the pinyon-juniper cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

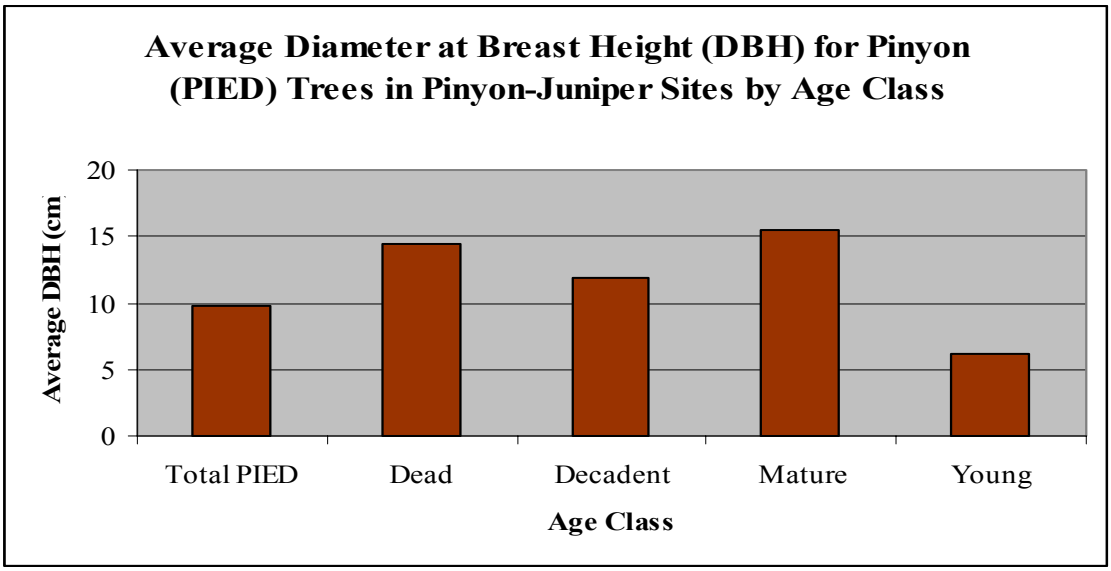

Figure 8. Age class structure and average diameter at breast height (DBH) for pinyon trees in the pinyon-juniper cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

Shrub Density:

Shrub 'belt' transects were read along the west edge of established sample plots. These transect 'belts' are 2.5m x 50m (125 m^2 or 0.031 ac). Any shrub whose canopy extended into the 'belt' was counted. Species and age class (sapling, young, mature, decadent, or dead) were recorded.

Shrub Species Composition
Eighteen shrub species were recorded over 37 sample plots. Only five of the 18 species (28%) were found in both cover types. Sagebrush cover types were more diverse than pinyon-juniper cover types with respect to the maximum number of shrub species which occurred on any one plot (14 species on sagebrush versus 9 species on pinyon-juniper).

Table 2. Shrub Species Occurrence in Sagebrush and Pinyon-Juniper Cover Types

	Common name	Species Name	Sagebrush	Pinyon-juniper
1	Utah service berry	*Amelanchier utahensis*	☐	☒
2	black sagebrush	*Artemisia nova*	☒	☒
3	big sagebrush	*Artemisia tridentata*	☒	☒
4	fernbush	*Chamaebatiaria millefolium*	☒	☐
5	rubber rabbitbrush	*Chrysothamnus nauseosus*	☒	☐
6	yellow rabbitbrush	*Chrysothamnus viscidiflorus*	☒	☐
7	Torrey's jointfir	*Ephedra torreyana*	☒	☐
8	Mormon tea	*Ephedra viridis*	☒	☒
9	crispleaf buckwheat	*Eriogonum corymbosum*	☒	☐
10	slender buckwheat	*Eriogonum microthecum*	☒	☐
11	Apache plume	*Falluga paradoxa*	☒	☐
12	broom snakeweed	*Gutierrezia sarothrae*	☒	☒
13	winterfat	*Krascheninnikovia lanata*	☒	☐
14	Whipple cholla	*Opuntia whipplei*	☒	☐
15	Mexican cliffrose	*Purshia mexicana*	☒	☒
16	Antelope bitterbrush	*Purshia tridentata*	☐	☒
17	Gambel oak	*Quercus gambelii*	☐	☒
18	banana yucca	*Yucca baccata*	☐	☒

Total Number of Shrubs
A total of 5,337 shrubs were recorded on 37 sample plots in the Buckskin Project area. Of these, 2,383 were located in pinyon-juniper cover type and 2,954 of these were located in sagebrush cover type.

Shrub Density per plot
Across the entire study area the number of shrubs per plot was 144. The average number of shrubs per plot in sagebrush cover type was 184. The average number of shrubs per plot in pinyon-juniper cover type was 113.

Shrub Density per Acre
Over the entire study area, there were 4,669 shrubs per acre. In pinyon-juniper cover type there were 3,673 shrubs per acre. In sagebrush cover type there were 5,976 shrubs per acre.

Sagebrush cover type
Fourteen species of shrubs occurred over 16 sample plots. The four most frequently occurring shrub species were big sagebrush (*Artemisia tridentata*), broom snakeweed (*Gutierrezia sarothrae*), winterfat (*Krascheninnikovia lanata*), and rabbitbrush (*Chrysothamnus nauseosus*).

Big sagebrush had the highest relative density (61%) in sagebrush cover type, followed by broom snakeweed (13%), winterfat (11%), yellow rabbitbrush (8%), crispleaf buckwheat (*Eriogonum corymbosum*) (5%), and cliffrose (1%). All other species counted represented less than 1% of relative density.

The mean number of big sagebrush plants on any given plot in sagebrush cover type was 112 (SE ±18). The mean number of broom snakeweed plants was 24 (SE ± 9), the mean number of winterfat plants was 20 (SE ± 20), and the mean number of yellow rabbitbrush was 14 (SE ± 13).

The mean number of big sagebrush plants per acre in sagebrush cover type was 3626 (SE ± 583). The mean number of broom snakeweed plants per acre was 777 (SE ± 291), the mean number of winterfat plants per acre was 647 (SE ± 647), and the mean number of yellow rabbitbrush plants per acre was 453 (SE ± 421)

Table 3. Mean Shrub Density by Species in Sagebrush Cover Type

Species	Mean		Std. Error of Mean		Sum
	Per plot	Per acre	Per plot	Per acre	Per plot
ARNO4	0.1	2	0.1	2	1
ARTR	112	3625	18	578	1786
CHMI2	0.1	4	0.1	4	2
CHNA	0.4	12	0.3	8	6
CHVIS5	14	467	13	426	231
EPTO	0.1	2	0.1	2	1
EPVI	0.4	14	0.3	10	7
ERCOA	8	271	6	210	134
ERMI4	2	49	2	49	24
FAPA	1	45	1	45	22
GUSA	24	765	9	307	378
KRLA2	20	641	20	641	317
OPWH	0.1	2	0.1	2	1
PUME	3	89	2	66	44
Total					2954

Age Class

The most common age class for shrubs in sagebrush cover type was mature with 39% of all shrubs. Dead shrubs were 23% of the total, 17% were decadent, 16% were young, and 2% were saplings.

Of the 55 saplings counted in sagebrush cover type, most were crispleaf buckwheat (33%), 27% were big sagebrush, 20% were broom snakeweed, 11% were winterfat, and 9% were Apache plume (*Fallugia paradoxa*).

Of the 482 young shrubs counted in sagebrush cover type, most were either big sagebrush (27%) or broom snakeweed (24%); 16% were winterfat, 13% were crispleaf buckwheat, 8% each were cliffrose and yellow rabbitbrush, and 3% were Apache plume. Black sagebrush, fernbush (*Chamaebatiaria millefolium)*, rubber rabbitbrush, Mormon tea (*Ephedra viridis*), and slender buckwheat (*Eriogonum microthecum*) were each less than 1%. No young Whipple chollas (*Opuntia whipplei*) were counted.

Of the 1153 mature shrubs counted in sagebrush cover type, most were big sagebrush (55%), 15% were winterfat, 12% each were broom snakeweed and yellow rabbitbrush, and 4% were crispleaf buckwheat. Fernbush, Torrey's jointfir (*Ephedra torreyana*), Mormon tea, rubber rabbitbrush, slender buckwheat, Whipple cholla, and cliffrose were all less than 1%. No mature black sagebrush (*Artemisia nova*) or Apache plume were counted.

Of the 590 decadent shrubs counted in sagebrush cover type, most of the decadent shrubs were big sagebrush (81 %), 10% were winterfat, 5% were yellow rabbitbrush, 2% were broom snakeweed, and 1% were crispleaf buckwheat. Slender buckwheat, Apache plume, and cliffrose were each less than 1%. Decadent big sagebrush occurred on every plot. No decadent black sagebrush, fernbush, rubber rabbitbrush, Torrey's jointfir, Mormon tea, or Whipple chollas were counted.

Of the 674 dead shrubs counted in sagebrush cover type, most of the dead shrubs were big sagebrush (80 %), 14% were broom snakeweed, and 4% were yellow rabbitbrush. Mormon tea, crispleaf buckwheat, slender buckwheat, winterfat, and cliffrose were each less than 1%. No dead black sagebrush, fernbush, rubber rabbitbrush, Torrey's jointfir, Apache plume, or Whipple chollas were counted. Dead big sagebrush occurred on every plot.

Pinyon-juniper cover type

Nine species of shrubs occurred over 21 plots. One plot had no shrubs at all. The four most frequently occurring shrub species were big sagebrush, black sagebrush, broom snakeweed, and Gambel oak.

Of all shrubs found in pinyon-juniper cover type 70% were big sagebrush, 12% were black sagebrush, 5% were broom snakeweed , 4% were Gambel oak, 4% were Utah serviceberry. Only 3% were cliffrose, and 2% were Mormon tea.

The mean number of sagebrush plants on any given plot in pinyon-juniper cover type was 79 (SE ± 17). The mean number of black sagebrush plants per plot was 13 (SE ± 13), the mean number of broom snakeweed plants per plot was 6 (SE ± 3), and the mean number of Gambel oak plants was 5 (SE ± 0.2).

Density per acre by species:
The mean number of sagebrush plants per acre in pinyon-juniper cover type was 2557 (SE ± 550). The mean number of black sagebrush plants per acre was 420 (SE ± 420), the mean number of broom snakeweed plants per acre was 184 (SE ± 97), and the mean number of Gambel oak plants per acre was 161 (SE ± 7).

Table 4. Mean Shrub Density by Species in Pinyon-Juniper Cover type

Species	Mean		Std. Error of Mean		Sum
	Per plot	Per acre	Per plot	per acre	Per plot
AMUT	4	146	3	84	94
ARNO4	13	421	13	421	275
ARTR	79	2567	17	541	1665
EPVI	2	58	1	29	37
GUSA	6	185	3	91	119
PUME	3	107	1	26	69
PUTR2	1	16	0.4	13	10
QUGA	5	165	2	78	107
YUBA	0.3	10	0.2	7	7
Total					2383

Age class
Of all shrubs in pinyon-juniper cover type 50% were dead, 20% were decadent, 13% were mature, 12% were young and only 4% were saplings.

Of the 103 saplings counted in pinyon-juniper cover type, most (69%) were big sagebrush, 18% were Utah serviceberry, 6% were Gambel oak, only 4% were cliffrose, and 3% were broom snakeweed. No saplings were counted for black sagebrush, Mormon tea, bitterbrush, or yucca.

Of the 291 young shrubs counted in pinyon-juniper cover type, most were big sagebrush (56%), 20% were Gambel oak, 10% were Utah serviceberry, 7% were broom snakeweed, 4% were Mormon tea, only 2% were cliffrose, and 1% were bitterbrush. Black sagebrush was less than 1%. No young yuccas (*Yucca baccata*) were counted.

Of the 307 mature shrubs counted in pinyon-juniper cover type, most were big sagebrush (54%), 18% were broom snakeweed, 7 % were Gambel oak, 6% were Mormon tea, 4% were Utah serviceberry and cliffrose, 3% were black sagebrush, 2% were yucca, and only 1% were bitterbrush (*Purshia tridentata*).

Of the 474 decadent shrubs counted in pinyon-juniper cover type, most were big sagebrush (71%), 12% were black sagebrush, 7% each were Utah serviceberry and cliffrose, and 2% were Mormon tea. Bitterbrush, Gambel oak, and broom snakeweed were each less than 1%. No decadent yuccas were counted.

Of the 1193 dead shrubs counted in pinyon-juniper cover type, most were big sagebrush (78%), 18% were black sagebrush, 3% were broom snakeweed, only 1% were cliffrose. Both Utah serviceberry and Gambel oak were less than 1%. No dead shrubs were counted for yucca, bitterbrush, or Mormon tea.

Shrub Cover (line intercept):

Average cover for all woody species (trees and shrubs) was collected along a 50 meter line intercept. The amount of medium (1-2" diameter) and large (2"+ diameter) sized plant litter was also recorded and averaged. Cover was averaged for both individual sites and by cover type.

In the sagebrush cover type, big sagebrush had the greatest average cover at 13% (SE=2.5, s^2=96.0) followed by dead sagebrush cover at 7% (SE=1.4, s^2=30.8) (Figure 9). Other common entities included juniper at 3% cover (SE=1.4, s^2=29.4) and large litter at 3% (SE=0.66, s^2=6.1). The relationship of live to dead sagebrush cover in the line intercept corroborates results from the Daubenmire frame data where live is greater than dead cover. Although cover values were lower and differences in live and dead less pronounced in the Daubenmire frames, it is likely a result of the sampling frame size.

In the pinyon-juniper cover type, live juniper trees had the greatest average cover at 16% (SE=2.1, s^2=89.3) (Figure 10). Pinyon also had a relatively high cover at 6% (SE=2.5, s^2=128.0). Other common components included live sagebrush at 4% average cover (SE=0.86, s^2=15.5), dead sagebrush at 4% average cover (SE=1.3, s^2=35.4), and medium sized litter at 4% average cover (SE=2.4, s^2=100.8). The average dead sagebrush cover was slightly higher in the pinyon-juniper cover type, the opposite relationship found in the sagebrush cover type. The increased cover of decadent and dead sagebrush in the pinyon-juniper cover types was observed throughout the study area and may be a result of potential increased competition with tree species or a combined result of shallow rocky soils and successive years of drought conditions. The pinyon-juniper cover type is also critical winter range due to the thermal cover and sagebrush is the preferred browse in late winter which may also contribute to physiological stresses on sagebrush.

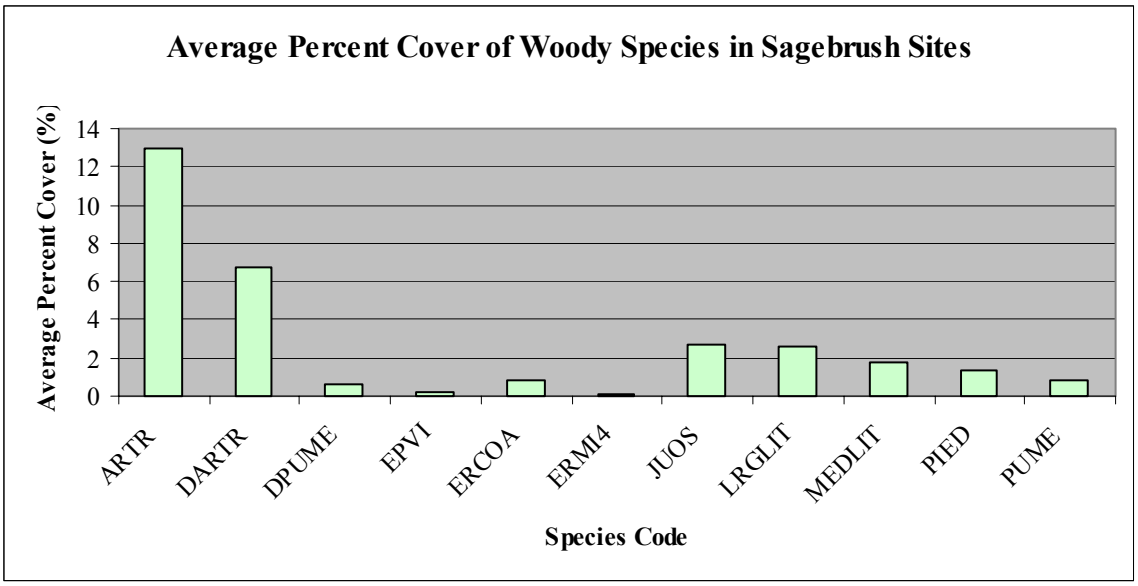

Figure 9. Average cover by species for woody plants in the sagebrush cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

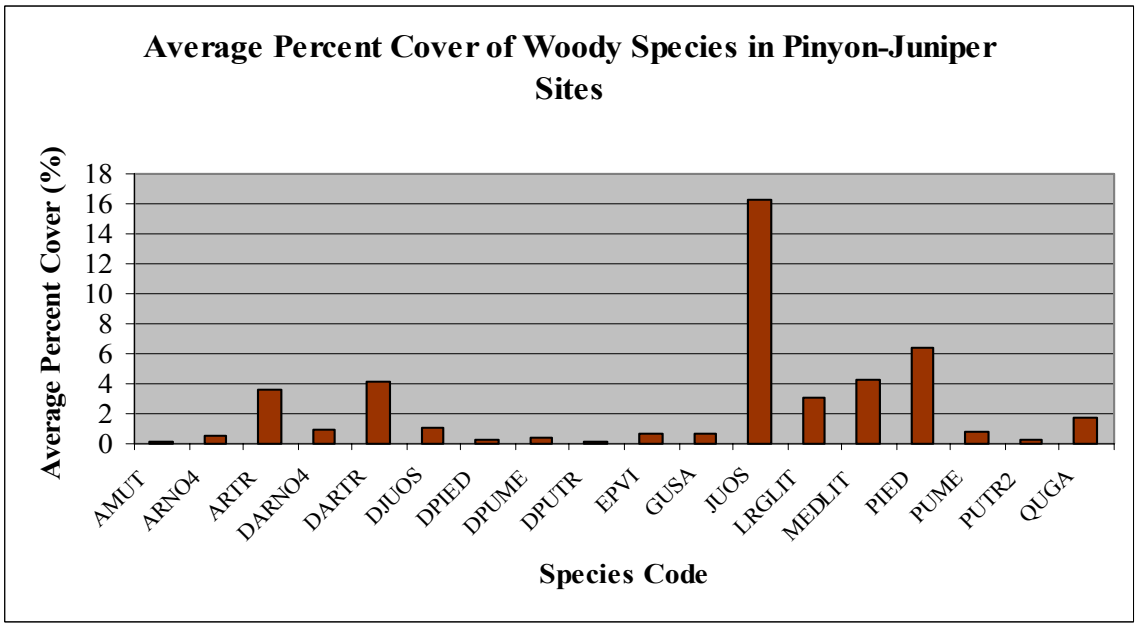

Figure 10. Average cover by species for woody plants in the pinyon-juniper cover type on the Buckskin Mountain Assessment Area, Grand Staircase Escalante National Monument, Utah.

Browse Condition:

Data collected on browse species in 2003 for deer included the form class or degree of availability to deer, age class, and the average leader length. In the early spring of 2004, utilization will be collected and from this a Use Index can be calculated. These results

will be reported at a later time. Data collected in 2003 were summarized by cover type and are reported below.

Form Class

In both the sagebrush and pinyon-juniper cover types, form class 1 (all available, little to no hedging) was the most commonly observed category of browse (Table 5). Percent of browse species in each form class was similar in both cover types with the exception of form class 5 (partially available, moderately hedged) where sagebrush cover types were higher than pinyon-juniper sites.

Table 5. Browse Species Availability by Cover Type.

Form Class*	Average Percent in Each Class	
	Sagebrush Cover Type	**Pinyon-Juniper Cover Type**
1	50%	42%
2	20%	28%
3	3%	1%
4	0%	4%
5	11%	0%
6	4%	1%
7	0%	2%
8	0%	0%

*Form Class Definitions:
1 All available, little or no hedging
2 All available, moderately hedged
3 All available, severely hedged
4 Partially available, little or no hedging
5 Partially available, moderately hedged
6 Partially available, severely hedged
7 Unavailable
8 Dead

Age Class

In sagebrush cover types, decadent browse was the most commonly observed category at 33% (SE=0.06, s^2=0.06) (Table 6). Mature browse was slightly lower at 30% of all browse (SE=0.06, s^2=0.07). Pinyon-juniper cover types also had decadent browse as the highest category but at 46% (SE=0.08, s^2=0.15), the percentage was higher than in the sagebrush cover type. A possible reason for this difference may be the greater abundance of cliffrose, which were typically decadent, in the pinyon-juniper cover type.

Table 6. Age Class Distribution of Browse Species in each Cover Type.

Age Class	Average Percent in Each Class	
	Sagebrush Cover Type	**Pinyon-Juniper Cover Type**
Seedling	0%	4%
Young	12%	13%

Mature	30%	12%
Decadent	33%	46%

Leader Length

The average leader length in sagebrush cover types was 6.68 millimeters (mm) (SE=1.0, s^2=16.8). The average leader length in the pinyon-juniper cover type was 9.97 mm (SE=3.4, s^2=242.8).

APPENDIX A

SPECIES CODE DEFINITIONS

Plant Species	Plant Code
Dead Amalanchier utahensis	DAMUT
Dead Artemisia tridentata	DARTR
Dead Chamaebatiaria millefolium	DCHMI
Dead Cowania mexicana	DCOME
Dead Fallugia paradoxa	DFAPA
Dead Guterrieza sarothrae	DGUSA
Dead Juniperus osteosperma	DJUOS
Dead Pinus edulis	DPIED
Dead Purshia tridentata	DPUTR
Dead Quercus gambellii	DQUGA
Medium Litter 1-2"	MEDLIT
Large Litter 2"+	LRGLIT
Bare Ground	BARE
Squam. Lich	SQLI
Gelat. Lich	GELI
Cyano.	CYAN
Crust. Lich	CRLI
Short Moss	SHMO
Rock	ROCK
Litter	LITTER
Cymopteris newberryi	CYNE
Purshia mexicana	PUME
Phlox hoodii	PHHO
Bromus tectorum	BRTE
Poa secunda	POSE
Gilia inconspicua	GIIN2
Dead Purshia mexicana	DPUME
Stipa hymenoides	STHY6
Ephedra torreyana	EPTO
Ephedra viridis	EPVI
Elymus elymoides	ELEL5
unknown forb1	UFORB1
Euphorbia fendleri	EUFE2
Erodium cicutarium	ERCI6
Descurainia sophia	DESO2
Sphaeralcea paravifolia	SPPA2
Salsola pestifer	SAPE10
Poa fenderliana	POFE
Cryptantha gracilis	CRGR3
Gayophytum ramosissimum	GARA2
Gilia aggregata	GIAG
Plantago patagonica	PLPA2
Festuca octoflora	FEOC3
Phlox austromontana	PHAU3
Microsteris gracilis	MIGR
Yucca baccata	YUBA
Dead Yucca baccata	DYUBA
dead Sphaeralcea parvifolia	DSPPA2
dead Ephedra viridis	DEPVI
Artemisia nova	ARNO4
Chrysothamnus viscidiflorus var. stenophylla	CHVIS5
Echinocereus triglochodiatus	ECCOC
Eriogonum ovalifolium	EROV

Foliose lichen	FOLI
Mentzelia albicaulis	MEAL6
Draba cuneifolia	DRCUC
Cryptantha micrantha	CRMI
Krascheninnikovia lanata	KRLA2
Chrysothamnus nauseosus	CHNA
Hilaria jamesii	HIJA
Dead Artemisia nova	DARNO4
Opuntia whipplei	OPWH
Eriogonum cernuum	ERCE2
Eriogonum microthecum	ERMI4
Camissonia exilis	CAEX10
Eriogonum corymbosum	ERCOA
Dead Eriogonum corymbosum	DERCOA
Stanleya pinnata	STPI
Dead Chrysothamnus viscidiflorus var. stenophyllus	DCHVIS
Erigonum sp.	ERSP
Juniperus osteosperma	JUOS
Pinus edulis	PIED
Quercus gambellii	QUGA
Artemisia tridentata	ARTR
Cowania mexicana	COME
Amalanchier utahensis	AMUT
Guterrieza sarothrae	GUSA
Purshia tridentata	PUTR2
Chamaebatiaria millefolium	CHMI
Fallugia paradoxa	FAPA