

**Carbondale Hill Elk Winter Range
Enhancement Project**

**Linda Cerney and Paul Jones
Alberta Conservation Association**

February 2000

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Executive Summary

Carbondale Hill is the focus of an enhancement project to improve traditional elk winter range. The site was once considered ideal winter range that provided forage for hundreds of elk. At the present time the site is used minimally due to the high degree of brush encroachment limiting the availability of grass species. This has resulted in private lands to the east becoming more attractive to elk, which has led to increased rancher/elk conflicts. The goal of the project is to maintain approximately 350 acres of open grasslands to increase over wintering capabilities of Carbondale Hill. In 1999/2000, the project proposes to remove aspen and conifer from a sub-alpine area to stimulate growth of bluebunch wheat grass and enlarge the meadow in Area B.

All sites had vegetation assessments completed in 1999. Areas A & B were proposed for complete aspen removal, however no removal occurred in A. Only a small section was removed in B, therefore creating 2 plots, a residual and a treatment. The predominant grass species in the previous year were hairy wild rye, Kentucky blue grass, timothy and traces of rough fescue and brome. In 1999, the predominant grass species were timothy (plot A, B (residual) and C), and an unidentified trisetum species (plot B (treatment)). In plot D there was no significant grass or grass like species. The forbs have almost changed completely with the only common plant over the two years of assessments being wild strawberry (plot A & D) and cow parsnip (plot A). Showy aster (plot A, B(treatment), and D), showy fleabane (plot B (residual), C and E) and, sticky purple geranium (plot B (residual), and C) were the most dominant forb species. A new five acre sub- alpine site was established in August 1999, and had a pre-assessment completed shortly before the trees were removed by chain and brush saws. The dominant grass species for both sites, (1 and 2) are bluebunch wheat grass and fescue species, with harebell (site 1) and common yarrow (site 2) as the dominant forbs.

Ungulate use of the area were assessed using pellet transects. These transects were established with 2 m. wide belt transects in 1998 and pellet group counts were recorded for ungulate winter use and then cleared of the pellets in June 1999 with the exception of Area A, (they were discontinued due to no aspen removal). Also discontinued from the pellet transects were the non-treatment sites into the coniferous habitat as it was felt that they would not provide appropriate comparison with the treatment areas. The total transect lengths for the winter counts initially were 1700 m. Improvement of the transects with wooden stakes were placed along the transects in October 1999 to increase their visibility and then re-cleared of pellets. The pellet transects (1840 m total) were again recorded and cleared (of pellets) in areas B-E and the new 2 sub-alpine sites for summer usage. Based on these pellet group counts, ungulate use indicated (although minimal), that elk were the dominant species using the areas in both winter and summer counts. A significant amount of pellet groups were located on the control (plot E) and the sub-alpine sites.

Aspen removal was conducted from 1997- 1999 by means of a gyro mower (lower sites) and chain and brush saws (sub-alpine site). Areas proposed for aspen removal (A and B) were not completed except for a section in area B (6.5 acres). A further 20 acres was removed in Area B

by a D8 cat in January, 2000 bringing the total for area B to 26.5 acres. A total of 15 acres were removed in 1997 from area C and D combined. A single acre of aspen and conifers were manually removed from the sub-alpine site. For the 3 years of tree removal on Carbondale Hill a total of 42.5 acres have been removed.

Future project recommendations are given including continued vegetation assessments, further winter pellet evaluation in all areas and the placement of a sign informing the public of the enhancement project.

Cover Photographs: Rocky Mountain Elk (*Cervus elaphus*)
Aspen removal with brush saw- M. Piorecky, 1999
Carbondale Hill Sub-alpine site, Block 2, 1999

Suggested Citation: Cerney, L. and P. Jones. 2000. Carbondale Hill Elk Winter Range
Enhancement Project. Alberta Conservation Association. Lethbridge, AB.

Acknowledgements

We wish to thank the following organizations for their assistance with this project: Financial - Shell Environmental Fund, Rocky Mountain Elk Foundation, and the Willow Valley Gun and Game Club; Technical- Land and Forest Service (LFS) staff: Mike Alexander, and Natural Resources Service (NRS) staff: Jim Clark and Richard Quinlan. The field crew were: Paul Jones (Project Manager- all field assessments), Brian Millar (vegetation and winter pellet transects), Mark Piorecky (vegetation assessments and aspen removal) and Linda Cerney (summer pellet transects).

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1.0 Background

Carbondale Hill is the focus of an enhancement project to improve traditional elk winter range. The site was once considered ideal winter range that provided forage for hundreds of elk. At the present time the site is used minimally due to the high degree of encroachment by shrubs, conifer and aspen resulting from fire suppression. The last large fire to occur in the area was in the 1930's, with a historical fire cycle of approximately 70-80 years (M. Alexander 1998, AB. Lands and Forest Service pers. comm.). The hillsides and ridges that were once chinook prone, now trap snow and are not easily grazed by elk.

In addition, the canopy created by the aspen and pine restrict the growth of grass and forb species. This has resulted in private lands to the east becoming more attractive to elk, which has led to increased rancher/elk conflicts. Originally fire was proposed to control the encroaching aspen, but upon closer inspection of the site, was deemed inappropriate. Due to shallow soils on the site that may be prone to sterilization, little litter build up, and the potential for an uncontrolled fire resulting from site topography and limited areas for fire guards, mechanical clearing was employed instead of fire (Dorge 1997). Enhancements on Carbondale Hill began in 1997 with approximately 15 acres of aspen being removed with a gyro-mower. Work continued in 1998 with approximately 6.5 acres of aspen being removed (Jones 1998).

Timothy is considered to be an exotic grass species because it has been introduced to North America. This grass has been determined to have limited winter forage value (Nelson and Legee 1982) and has appeared in vegetation assessments conducted at Carbondale Hill in 1998 (Jones 1998). Many native grasses such as a variety of fescue species provide ideal winter forage for various ungulates, however they cannot compete against a well established growth of timothy. It is becoming a growing concern for range managers, yet little is known about control methods.

2.0 Goals and Objectives

The goal of the project is to maintain approximately 350 acres of open grasslands to increase over wintering capabilities for elk on Carbondale Hill. In its 3rd year, this project will continue activities initiated in the previous 2 years and begin assessments of usage by elk. The objectives are:

- (1) Enlarge clearings to increase available winter forage for elk.
- (2) Reduce elk/landowner conflicts on surrounding private lands.
- (3) Conduct vegetation assessments on treated areas, controls and proposed areas for tree removal in 1999.
- (4) Assess use of the sites by elk and other ungulates along established pellet transects following aspen clearing (treatment), and also on control and residual sites.

3.0 Project Area

Aspen and conifer removal has or is planned for 3 sites in an area known as Carbondale Hill (S.29-5-3-W5M, S.31-5-3-W5M, and S.32-5-3-W5M) (Figure 1). The lower site consists of 2 areas (C and D) that were cleared in 1997 by a gyro-mower (15 acres removed). The upper site consists of 2 areas (A and B) and a control area (E), of which aspen was removed from only one area (Area B). Six and a half acres of aspen were removed using a gyro-mower from area B in 1998. Further removal of aspen from Area B is scheduled for the winter of 1999/2000. The sub-alpine area presently consists of 2 areas with aspen and pine removal scheduled for 1999 by brushsaw and chainsaw. All sites are predominately south-west facing slopes.

4.0 Vegetation Assessment

Revegetation of the Carbondale Hill area following mechanical removal of the aspen will be limited to those species present unless seeding is employed. A pre and post harvest vegetation assessment should be conducted to determine the pre harvest plant community and the vegetation community present following aspen removal.

All assessments followed the general guidelines of the MF5 vegetation inventory form (Robertson and Adams 1990). Grass and forbs were evaluated using 10 evenly spaced 0.1m² quadrates, while shrub cover was evaluated in a 10m² quadrate located at the centre of the transect. When possible pre-vegetation assessments were conducted prior to tree removal (upper and sub-alpine sites). Assessments were conducted in areas proposed for aspen removal and ran parallel to the slope. No pre-assessments were conducted for the lower site (Area C and D). In this case, transects were established the summer following aspen removal. Figure 2 indicates the location of the vegetation plots for all 3 sites. Comparisons between sites were not made because of difference in vegetation communities associated with slope position and soil types. Appendix A contains copies of the MF5 forms for all vegetation plots conducted.

All species listed have a 5% or greater prominence value within each of the vegetation plots. Common and Latin names followed those given by Moss and Packer (1994) and Parish et al. (1996). Winter forage values for the species present at all the areas is based on research information from Tannas (1997), Nelson and Leege (1982) and Kufeld (1973). Several of the species listed have unknown winter forage values and have been noted in their appropriate areas.

4.1 Upper Site

The upper site (Area A & B- Figure 2) was originally set as a treatment site with tree removal to have taken place in 1999, however only a small section was removed in Area B and no removal in Area A. Pre- assessment of the vegetation present was conducted on July 7 and July 10, 1998 and a post-assessment conducted on August 15, 1999.

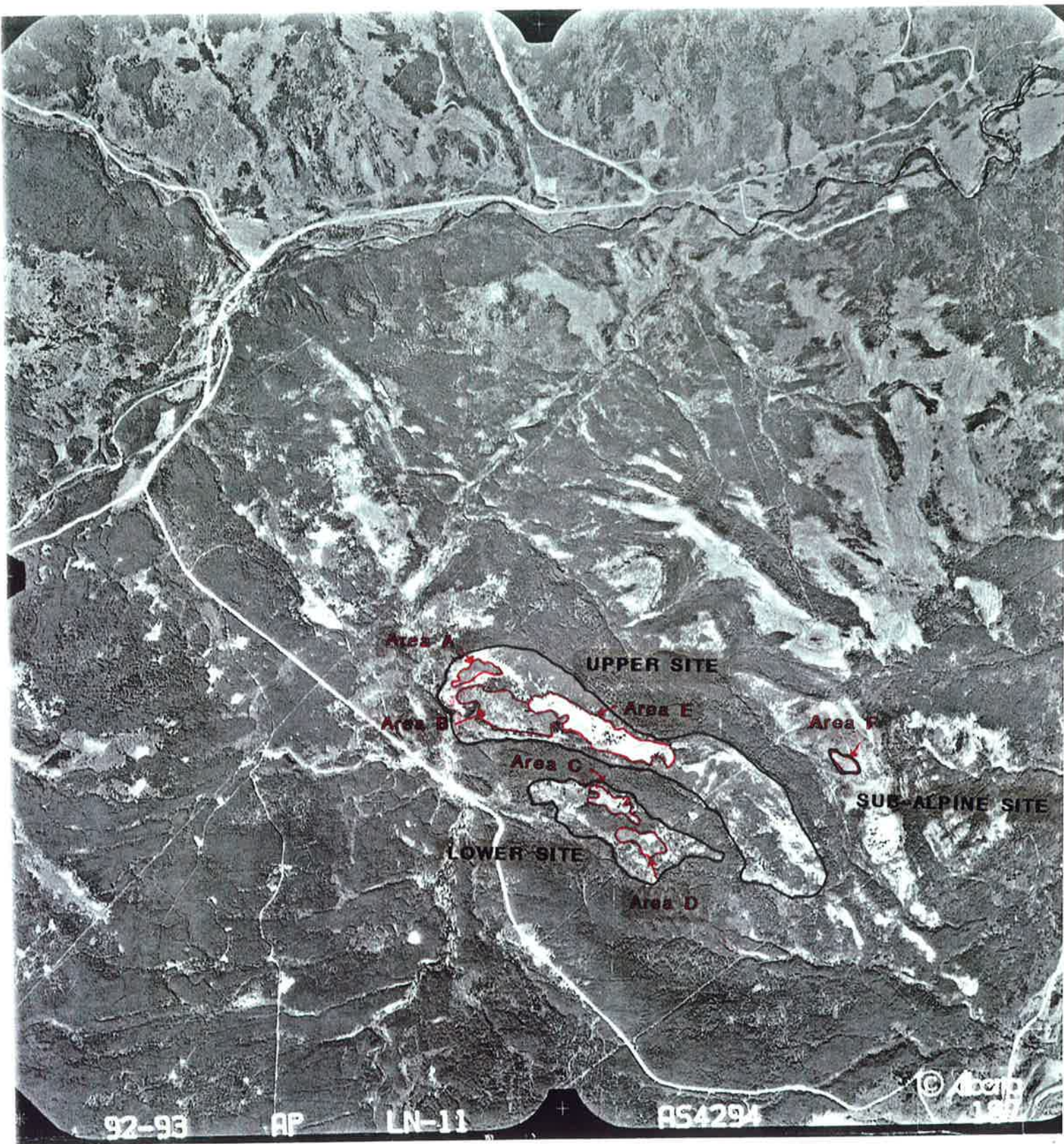


Figure 1 Carbondale Hill Elk Winter Range Enhancement Project study area. (Scale 1:30,000)

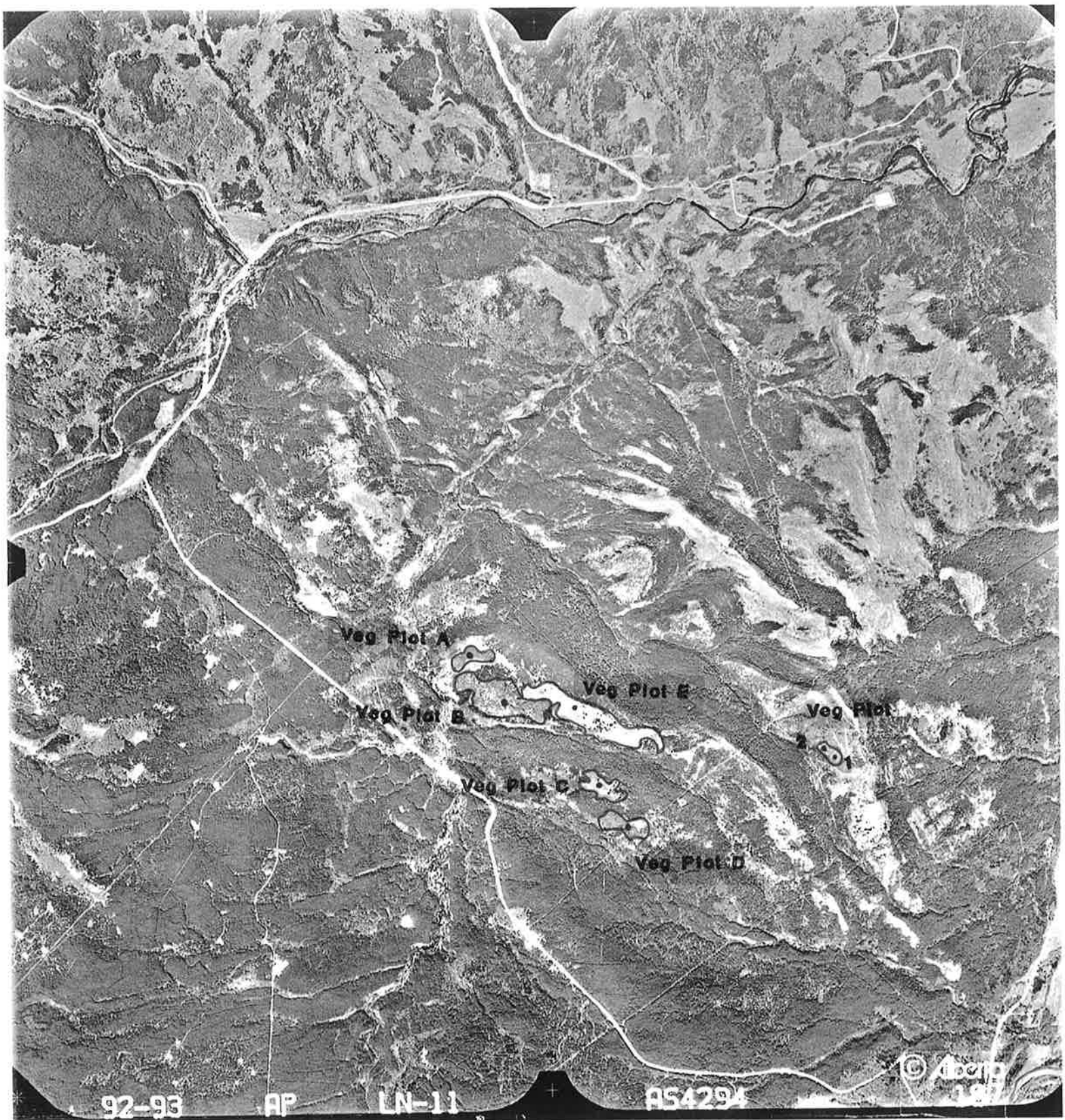


Figure 2: Vegetation plot locations for all areas, Carbondale Hill 1999. (Scale 1:30,000)

Table 1 Winter forage value of grass, grasslike, and forb species present in Plot A, Carbondale Hill assessment comparisons, 1998 and 1999.

Assessment - 1998		Assessment - 1999	
Plant ^a	Winter Forage Value ^b	Plant ^a	Winter Forage Value ^b
Grass and Grasslike Plants:		Grass and Grasslike Plants:	
Hairy Wild Rye	Poor to Moderate	Timothy	Poor to Moderate
Meadow Sedge	Moderate		
Forbs:		Forbs:	
Cow Parsnip	Good	Showy Aster	Good
Tall Buttercup	Poor	Wild Strawberry	Poor to Moderate
Strawberry	Poor to Moderate	Ragwort	Poor
Star-Flowered Solomon's Seal	Moderate	Cow Parsnip	Good

^a species with > 5% prominence value, listed in order of predominance

^b based on Tannas 1997, Nelson and Leege 1982 (Table 52:344-347 and Table 53:348-349) and Kuefeld 1973.

4.1.1 Area A

The dominant species in plot A have changed since the pre- assessment (Table 1). Timothy appears to have replaced hairy wild rye as the dominant grass species. Showy aster and ragwort have moved into the area and along with wild strawberry, are the dominant forb species. Wild strawberry has increased and cow parsnip decreased since the pre- assessment recording. The winter forage value for elk in this area appears to be slightly better from the 1998 assessment.

4.1.2 Area B

Originally proposed for complete tree removal, Area B now contains a residual plot (assessed in 1998) and a smaller treatment plot established in 1999. Pre- assessment indicated that Kentucky blue grass was the dominant grass species, but a significant change has occurred in this area. A large percentage of timothy in the residual plot and a species of trisetum in the treatment plot are now the dominant species present. Even the forb species have changed with sticky purple geranium, showy fleabane and wild strawberry having high presence in the residual plot. Showy aster, cream-colored vetchling, an unidentified pea species and white angelica are the forbs dominating the treatment plot. None of the above mentioned forbs appeared as the dominant species in the vegetation pre- assessment in 1998. Elk winter forage values in the residual site are poor and the treatment site may be good based on some of the species present, yet is unclassified

Table 2 Winter forage value of grass, grasslike, and forb species in Plot B, Carbondale Hill assessment comparisons, 1998 and 1999.

	Grass and Grasslike Plants ^a	Winter Forage Value ^b	Forbs ^a	Winter Forage Value ^b
Pre-Assessment - 1998	Kentucky Blue Grass	Moderate- Good	Pepper Grass	Unknown
	Timothy	Poor-Moderate	Dandelion	Poor
			Canada Anemone	Poor
			Sweet Cicely	Poor
			Orange False Dandelion	Moderate
Post-Assessment- 1999 (Residual)	Timothy	Poor to Moderate	Sticky Purple Geranium	Poor
			Showy Fleabane	Poor
			Wild Strawberry	Poor to Moderate
			Common Yarrow	Poor
Post Assessment - 1999 (Treatment)	Trisetum sp.	Good	Showy Aster	Good
			Cream-colored Vetchling	Poor
			Pea sp.	?
			White Angelica	?
			Wild Strawberry	Poor to Moderate
			Western Meadow Rue	?

^a species with > 5% prominence value, listed in order of predominance

^b based on Tannas 1997, Nelson and Leege 1982 (Table 52:344-347 and Table 53:348-349) and Kuefeld 1973.

due to the unknown forage value for 3 of the forb species. Table 2 indicates the pre- and post-vegetation assessments and their winter forage value for elk for both plots for Area B and Figure 3 shows vegetation in the treatment plot of Area B.

4.1.3 Area E

Area E is an existing open meadow and was established as a control site (Figure 4). Its location is just east of Areas A and B and higher on the slope. A visual assessment of Area E in 1998 stated that timothy and wild rye were the prevalent grass species (Jones 1998, p.8). The vegetation assessment in 1999 indicated that the predominant species were timber oat grass, timothy and tufted hair grass. Forbs in this area include an unidentified species, showy fleabane and field pussytoes. This unidentified forb species was more dominant over the other 2 species. Harebell was also present but was just under the 5% prominence value (Appendix A). The

Table 3 Winter forage value of grass, grasslike and forb species on the Area E, an existing open meadow, Carbondale Hill, 1999.

Assessment - 1999	
Plant ^a	Winter Forage Value ^b
Grass and Grasslike Plants:	
Timber Oat Grass	Moderate
Timothy	Poor to Moderate
Tufted Hair Grass	Moderate
Forbs: *	
Showy Fleabane	Poor
Field Pussytoes	Poor

^a species with > 5% prominence value, listed in order of predominance

^b based on Tannas 1997, Nelson and Leege 1982 (Table 52:344-347 and Table 53:348-349) and Kufeld 1973.

* one unidentified forb was recorded as having a higher value (Appendix A) over the 2 species listed

grasses in the area show moderate winter forage value for elk but the dominant forbs indicate poor quality. Table 3 summarizes these vegetation assessment findings.

4.2 Lower Site

Removal of aspen in 2 distinct meadows occurred from August - September 1997 on the lower site (Area C & D). No pre-vegetation assessments were conducted at this site. Post-vegetation assessments of the areas were conducted on July 17, 1998 (year 1) and on August 14, 1999 (year 2). Table 4 summaries the results of the vegetation located in both Plots C and D.

4.2.1 Area C

The dominant grass in Plot C, continues to be timothy, however the forbs have changed since its first year of assessment. These forbs include showy fleabane, sticky purple geranium, common yarrow and wild strawberry, all of which have poor winter forage values. Figure 5 shows this areas revegetation after clearing in 1997.

4.2.2 Area D

On Plot D, the dominate grasses in the pre- assessment (1998) were timothy, Kentucky blue grass, and green needle grass. In the post- assessment (1999) (Figure 6) there were no dominant grass species (>5% prominence value). Awned wheat grass was the only specie that showed some distinct



Figure 3: Carbondale Hill 1999- Upper site, Area B Treatment.
Revegetation after 1998 clearing.



Figure 4: Carbondale Hill 1999- Upper Meadow, Area E Control.
Established spring, 1999.

Table 4 Winter forage value of grass, grasslike, and forb species present on the Lower site of Carbondale Hill (aspen removal conducted in fall 1997).

Location	Post Assessment -1998		Post Assessment - 1999	
Plot C	Grass and Grasslike Plants:	Winter Forage Value^b	Grass and Grasslike Plants:	Winter Forage Value^b
	Timothy	Poor to Moderate	Timothy	Poor to Moderate
	Forbs:		Forbs:	
	Aster sp.	Poor to Moderate	Showy Fleabane	Poor
	Pepper Grass	Unknown	Sticky Purple Geranium	Poor
	Arnica	Poor	Common Yarrow	Poor
			Wild Strawberry	Poor to Moderate
Plot D	Grass and Grasslike Plants:	Winter Forage Value^b	Grass and Grasslike Plants:	Winter Forage Value^b
	Timothy	Poor to Moderate	No significant grass species	
	Kentucky Blue Grass	Moderate to Good		
	Green Needle Grass	Good		
	Forbs:		Forbs:	
	Canada Anemone	Poor	Wild Strawberry	Poor to Moderate
	Strawberry	Poor to Moderate	Showy Aster	Good
			Cream-colored Vetchling	Poor
			Northern Bedstraw	Poor

^a species with > 5% prominence value, listed in order of predominance

^b based on Tannas 1997, Nelson and Leege 1982 (Table 52:344-347 and Table 53:348-349) and Kufeld 1973.

presence although in a small amount (4.3% prominence value)(Appendix A).

Wild strawberry has increased since the first post-assessment as the dominant forb species, along with showy aster and cream-colored vetchling. This entire area (inc. Area C) does not seem to be producing good winter forage for elk.



Figure 5: Carbondale Hill 1999- Lower site, Area C Treatment.
Revegetation after 1997 clearing.



Figure 6: Carbondale Hill 1999- Lower site, Area D Treatment.
Revegetation after 1997 clearing.



Figure 7: Carbondale Hill 1999- Sub-alpine site, Site 1 Control.



Figure 8: Carbondale Hill 1999- Sub-alpine site, Control.
Brush piles after clearing August, 1999.

Table 5 Winter forage value of grass, grasslike and forb species present on the new Sub-alpine site, Carbondale Hill pre- assessment, 1999.

Location	Pre- assessment - 1999			
Sub-alpine-1	Grass and Grasslike Plants ^a :	Winter Forage Value ^b	Forbs:	Winter Forage Value ^b
	Bluebunch Wheat Grass	Moderate to Good	Harebell	Poor
	Fescue sp.	Good		
	June Grass	Good		
Sub-alpine -2	Grass and Grasslike Plants ^a :	Winter Forage Value ^b	Forbs:	Winter Forage Value ^b
	Bluebunch Wheat Grass	Moderate to Good	Common Yarrow	Poor
	Fescue + 1 other Fescue sp.	Good		

^a species with > 5% prominence value, listed in order of predominance

^b based on Tannas 1997, Nelson and Leege 1982 (Table 52:344-347 and Table 53:348-349) and Kufeld 1973.

4.3 Sub-alpine (Area F)

Pre- vegetation assessments on both Areas 1 and 2 (Figure 7 and 8) were conducted in August 1999 just before the aspen removal began. Plots 1 and 2 had similar grasses of bluebunch wheat grass and an unidentified fescue species, with an additional species in Plot 1 of June grass. Harebell (Plot 1) and common yarrow (Plot 2) were the only real dominate forb species. This area provides good winter forage for elk with the grasses present, however the forbs provide poor forage value (Table 5).

4.4 Overall Vegetation Community

On winter ranges where both grasses and shrubs are available, elk will usually select grasses as the major portion of their diet (Morgantini and Hudson 1989, Morgantini 1987, Nelson and Leege 1982). Modification to the diet may occur based on the presence or absence of particular grass species. A study completed in southwestern Montana indicated that elk mainly used sagebrush type of vegetation with bluebunch wheat grass and bluebunch fescue as the most common grass and grass-like species consumed (Constan 1972). Certain grass species, such a rough fescue and bluebunch wheatgrass are highly prized by elk, while others are avoided during the winter. Timothy is one such grass species that is not selected heavily in the winter by elk because of its moderate to poor value (Tannas 1997, Nelson and Leege 1982). Morgantini et al. (1994) found elk in western Alberta did not utilize timothy as it is not a preferred winter forage, while Fargey and Hawley (1989) found elk in west-central Alberta utilized timothy as a winter forage, but that it was more frequently selected as a spring forage.

Plant species that may be considered valuable in one region may not be valuable in others. Invasive species tend to have highly successful seed dispersal and production, spread quickly, have few natural predators, grow rapidly and can out-compete native species, all at a high cost for removal and control (FON 1999 and Haber 1997). Invaders, such as timothy are a growing concern in many areas around the Carbondale Hill sites and have also been noted in the areas of Waterton Lakes National Park (McNeill 1999, Bailey 1976). The presence of timothy in the area is considered to have been established at the turn of the century as good forage for horses and cattle (Jones 1998).

Timothy (the dominant species in Plot C - control, after removal and now appearing in areas A and E- Figure 7) is considered to be spread by seed, therefore it would be ideal to reduce the spread of seeds by some form of control (Darlene Moisey pers. comm¹). Table 6 lists some control methods for timothy and other invasive species, the effect of implementation and possible concerns over its usage. Monitoring the status of the timothy through photographs, regular plant inventories and impact monitoring would be recommended in all methods of control established.



Figure 9: Carbondale Hill 1999- Timothy grass on Lower site, Area C.

¹Moisy, D. 1999. Personal Communication. Technician. Public Lands. Lethbridge, AB.

Table 6 Some Control Methods for Timothy and Other Invasive Plant Species

Method	Effect	Concern
Seeding (with more palatable forages)	Promotes native grass species	- Take several years to establish. Inability for native species to establish itself due to the nature of the invasive species. Costly.
Fire or Controlled/Prescribed Burns	Removes dense thatch build up that provides an ideal bed for invasive species. It also releases vital nutrients back into the soil.	- Need ideal weather conditions and proper timing at a specific stage of growth. Personnel to monitor the fire/burn.
Grazing (by cattle)/ Mowing	Possibly prevents the spread of seeds if grazed at appropriate time	- Overgrazing if no management plan is in place- i.e. rotations.
Herbicides (Chemical)	Kills off the invasive species	- Can kill off all species including native species present.
Physical removal	Removes specific invader species	- Labour intensive.
Biocontrol agents	Target specific species	- Requires appropriate research for specific species- can be a lengthy process and may also become an invader species. Costly.
Natural selection	Allow nature to naturally fight the invasive species	- Native species present may be out competed by the invasive species and be unable to compete.

Source: De Clerck-Floate and Bouchier 1999, Federation of Ontario Naturalists 1999, McNeill 1999, Brown 1997, Haber 1997, Wisdom and Thomas 1996, Trottier 1992, Anderson and Scherzinger 1975

5.0 Elk and Ungulate Use

Belt transects (2 m wide) were established in the upper and lower site (Area A, B, C and D) (Jones 1998, p.13) in 1998 and the new sun-alpine site (1 and 2) in 1999. Transect lines were upgraded in 1999, with colored and flagged wooden stakes along each of the lines, to provide better visibility of movement from start to finish. The original orange re-bar stakes remain in place, although the ends of lines have been marked with 2 crossed wooden stakes.

Pellet group counts were used to estimate the usage of elk and other ungulate species on each of the established transects. The sampling areas are of varying sizes, causing a concern that pellet groups may be missed (Smith 1968). Therefore, at least two transects were established in each of the five main areas (Area A omitted, see below). The counts were conducted in June 1999 to estimate the winter usage of the area and in October 1999 for summer usage.

A 2 m pole was used to determine if the pellets were within the transect length. The observer walked down the middle of the transect holding the pole with equal distance (1 m) on either side of the transect. Length of the transects varied from one site to another and within a site as well (Appendix C). One pellet group is considered to contain approximately 30 or more pellets (Neff 1969). All pellet groups with at least half of the pellets (Cairns and Telfer 1980) located within the length of the pole and along the length of the transect were recorded. Pellets were then removed off the transect including those with less than the required number of pellets to constitute a group.

Area A pellet transects were discontinued because there was no aspen removal. All non treatment pellet transects were discontinued as they were in coniferous habitat and would not provide an appropriate comparison with the treated areas. Transects B1 and B5 were reclassified from treatment transects to residual transects as they reside in residual aspen.

5.1 Winter Pellet Count

Table 7 indicates the number of ungulate use measured by pellet group counts for the winter evaluation. Based on these counts, elk frequented the existing meadow (Area E- control) more often than the treatment and residual areas. The approximate total number of pellets per hectare was 326, 103 and 204 for elk, deer and moose respectively. An average of 1 pellet group per hectare indicates that the area had low usage by elk and hardly any usage by deer and moose. Summer feces of elk found along transects B5 (2 pellet groups), C2 (7 pellet groups) and D2 (1 pellet group) were noted but were not included in the winter table.

5.2 Summer Pellet Count

Elk pellet groups appeared on 79% of the transects on the winter count and on the majority of the summer counts (Table 8). Summer counts were conducted in plots B-F. Plot F is the new sub-alpine site which had a significant number of elk pellet groups (12) for its first clearing in October. Elk pellet groups were the most common ungulate throughout the summer especially in areas E and F. Total number of elk pellet groups per hectare, based on all transect lengths were 1528. The average number of pellets was also low (as recorded in the winter evaluation), however with a slight increase for all three species with the summer evaluation.

Table 7 Summary of winter ungulate use measured by pellet group counts for Carbondale Hill, 1999.

Species	Elk		Deer		Moose	
	N ^a	#/ha ^b	N	#/ha	N	#/ha
Transect						
B1	1	28	1	28	2	56
B2	1	28	1	28	1	28
B3	-	-	-	-	-	-
B4	-	-	-	-	-	-
B5	1	28	-	-	-	-
C1	1	50	-	-	-	-
C2	-	-	-	-	1	50
D1	-	-	-	-	1	28
D2	-	-	-	-	-	-
E1	3	67	1	22	-	-
E2	5	125	1	25	1	25
Average	1.1	29.6	0.4	9.4	0.5	17
Total #/ha		326		103		204

a= number of pellet groups counted on a 2 m. wide transect.

b= number of pellet groups per hectare based on MacCallum and Granger, 1993.

Table 8 Summary of summer ungulate use measured by pellet group counts for Carbondale Hill, 1999.

Species	Elk		Deer		Moose	
	N ^a	#/ha ^b	N	#/ha	N	#/ha
Transect						
B1	1	28	3	83	-	-
B2	-	-	-	-	-	-
B3	1	28	2	56	1	28
B4	-	-	-	-	-	-
B5	2	56	3	83	-	-
C1	2	56	-	-	-	-
C2	-	-	-	-	-	-
D1	3	83	-	-	1	28
D2	1	83	-	-	-	-
E1	2	44	-	-	1	22
E2	6	150	3	75	3	75
F1	5	417	1	83	2	167
F2	6	500	-	-	-	-
F3	1	83	-	-	-	-
Average	2.1	109.1	0.9	27.1	0.6	22.9
Total #/ha		1528		380		320

a= number of pellet groups counted on a 2 m. wide transect.

b= number of pellet groups per hectare based on MacCallum and Granger 1993.

5.3 Pellet Count Summary

Although it is too early to determine the success of the project, it appears that the majority of the area (with tree removal) has provided some forage habitat (although minimal) for elk in the Carbondale Hill area. As this is the first year of recording pellet counts, this preliminary data could be a good indicator that more elk may eventually arrive, if the revegetation of the area permits for good forage. Elk have been observed to mostly defecate while moving from one area to another (Collins and Urness 1979, Edge and Marcum 1989), if anything, we can assume that the elk are crossing through these areas. Future counts and comparisons could provide evidence of elk utilization and distribution at this location. Edge and Marcum (1989) indicated that usage of elk on

their study site was variable from year to year but habitat use was similar throughout the years of sampling.

Collins and Urness (1979) felt that the pellet group technique could be a good indicator in general areas for population numbers but may not be ideal for determining habitat preference for elk. Although this type of count method does not seem to be the best kind for determining habitat preference, it may indicate the worthiness of such a range improvement project.

Other studies could also be conducted in relation to the pellets. Since there appears to be some concern over the winter forage value of invasive species such as timothy, studies could be conducted to look at the pellets and what the elk have consumed in such an area. The type of information gained from pellet analysis could indicate whether one plant is favoured more than another and other improvement opportunities (i.e. additional seeding of native grass species) for elk could be conducted. As indicated by Rowland et al. (1984), potential biases can occur in relation to diet of elk. Seasonal changes, sex, age and activeness should be considered when comparing pellet group data for this purpose.

6.0 1999 Activities

6.1 Aspen and Conifer Removal

Aspen removal was performed in the falls of 1997 - 1999. Table 7 indicates the types, areas of removal, removal dates (if applicable) and the means of removal. Removal of aspen on the lower site (Area C and D) was conducted in August - September 1997 with a total of 15 acres being removed. Removal of aspen was conducted by Drain Brothers Construction Ltd. on September 1, 1998 in Area B, using a Bantam C-260 gyro-mower (2 24" blades and guard). Approximately 6.5 acres of aspen were removed from an 11.1 acre area in the upper site (Area B). The aspen removed were predominately trees less than 20 cm DBH, with trees larger being left for future removal by more economical means. The removal of aspen increased the size of the existing meadow (Area E) by approximately 15%. Another acre of aspen was removed in the subalpine sites. These sites were established in late August - early September 1999 with aspen harvested using chain and brush saws from September 2 -10, 1999, by Paul Jones and Mark Piorecky of the Alberta Conservation Association. The aspen and conifer cuttings were then placed into piles for burning at a later date (see Figure 8). A total of 22.5 acres of trees have been removed for this enhancement project.

As per request from Land and Forest Service, a clean up of Area B is scheduled for the winter of 1999/2000. Enhancement and clean up began on January 19th and was completed on January 26th, 2000. Drain Brothers was contracted using a D-8 Cat to clear and pile aspen and small pine within the enhancement area. The size of the enhancement area totals approximately 15 to 20 acres.

Table 9 Summary of aspen removal dates and equipment used for Carbondale Hill elk winter enhancement project.

Vegetation Area	Location	Type	Aspen Removal Date (if applicable)	Removal Type
A	Upper	Control	N/A †	N/A
B	Upper	Treatment	Small section removed 1999 * Enlarged in 2000	Gyro-mower D8 Cat
C	Lower	Treatment	August- Sept. 1997	Gyro-mower
D	Lower	Treatment	August-Sept. 1997	Gyro-mower
E	Upper	Control	N/A	N/A
1	Sub-alpine	Treatment	Late August/ Early Sept. 1999	Chain & Bush Saw
2	Sub-alpine	Treatment	N/A	N/A

† Area A was scheduled for tree removal in 1999 but was not completed

* Area B was scheduled for complete aspen removal in 1999, however only a small section was removed. Work in the area was completed in 2000.

6.2 Reclamation and Clean-up

The chips left by the gyromower work in Area B were piled along with the aspen and conifer removed by the D8 Cat. These piles along with the piles left in the sub-alpine area are scheduled for burning in the winter of 2000- 2001. In addition, Area B will be seeded with a mixture to see if more palatable forage species can be established on the site.

7.0 Recommendations

- (1) Continue to monitor the re-vegetation of the areas cleared of aspen and conifer. This will provide a model of how these sites regenerate and the types of forage they provide for elk. It will also provide a time frame as to how long it will take before these areas are providing benefits to elk. For areas that are proposed for aspen and conifer removal, pre-vegetation plots should be mandatory and assessed before tree removal occurs.
- (2) Continue monitoring of areas to assess ungulate use, utilizing the established pellet transects and methodology. Continued monitoring should occur for a minimum of 3 years post tree removal. In areas proposed for tree removal, transects should be established the year before any tree removal occurs. Spring assessments should occur in May prior to any significant vegetation growth, while fall assessments should occur in September/October prior to snowfall.
- (3) Conduct a feasibility assessment to determine a cost per acre for the tree removal and the value of the improvements to elk. The assessment should occur before any consideration is given to continued tree removal.
- (4) Develop and install a sign on site to inform the public of the enhancement work going on in the area. The sign has been requested by NRS (Jim Clark, NRS Blairmore) and would provide benefits to the project partners (ACA, NRS, LFS, RMEF and Shell Canada).

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Appendix A Vegetation inventory forms (MF5) for the 8 vegetation plots assessed on all areas of the upper, lower, upper meadow and sub- alpine sites on Carbondale Hill, 1999.

DISPOSITION/ALLOTMENT: C A R B O N D I A L E

FIELD/DU: treatment (not cut yet)

SITE NO: BLK "A"

POLYGON NO: 9910815

YR: 99

MO: 08

DAY: 15

EXAMINER: PJ/MP

RANGE TYPE: #U E 068935 N 5478639

LS: NAD 27

SEC: 39

TWP: 27

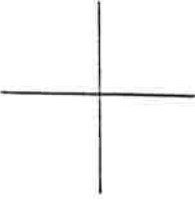
RGE: 39

SLOPE (%): 4°

ASPECT: S

ELEVATION (m): 1547

AIR PHOTO NO. AS: NO.

POLYGON GEOMORPHIC DESCRIPTION: 

GENETIC CODE: TEXTURE: SOIL: SOIL DRAINAGE:

TERRAIN PROFILE AND NOTES: Area was scheduled for harvest but will not be.

SITE DESCRIPTION (Circle one in each column)

REGIONAL LANDFORM	LOCAL LANDFORM	LANDFORM ELEMENT
Mountains	Steep Slopes	Crest
Hills	Hilly	Upper Slope
Uplands	Rolling	Mid-slope
Midlands	Hummocky	Lower Slope
Lowlands	Ridged	Terrace
Valleys	Plain	Level
		Depression

PHOTOS TAKEN Roll: 4 Number: 128

Description:

☐ MACROPLOT 10m²

☐ MICROPLOT .1m² ☐ Other _____ m²

PRODUCTION (lb./ac)

ESTIMATED CLIPPED: _____ FORAGE ☐ BRUSH ☐

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 D H L E D R A	2	2	2	X	X	4	X	1	X	1						14.6	610.0	135.6	17.7
2 K O E L C R I	3	X	X	3	2	X	X	X	X	2						13.5	410.0	122.1	14.8
3 A G I O T R A	X	X	X	X	X	X	X	X	X	3						11.5	110.0	14.7	1.0
4																1.0	1.0	1.0	1.0
5 G E R A U I I S	X	X	X	X	X	X	X	X	X	X						10.0	10.0	10.0	10.0
6 S I E N I E T R I	X	X	X	X	X	X	X	X	X	X						10.0	10.0	10.0	10.0
7 A I C H I M I L	3	3	X	X	X	2	X	X	X	X						13.3	310.0	118.1	13.9
8 F R A G V I R	3	2	4	X	3	2	2	3	2	3						110.8	910.0	1102.5	22.0
9 S I E N I E P I S I E	3	3	3	3	X	4	X	X	3	1						111.3	710.0	194.5	210.3
10 A I S T I E C I O N	X	4	3	4	3	3	3	3	X	3						115.1	810.0	1135.1	219.0
11 L A T I H O I C H	X	2	2	X	2	2	X	X	2	X						11.3	510.0	19.2	2.0
12 G A L I L I B I D R	X	2	X	2	X	X	X	X	X	X						10.5	210.0	12.2	10.5
13 E P I L I A N G	X	2	X	X	X	X	X	X	X	X						10.3	110.0	10.9	10.2
14 P I E A I S I P	X	X	1	X	X	2	X	X	X	1						10.4	310.0	12.2	10.5
15 A N G E A R G	X	X	X	3	3	X	X	X	X	X						13.0	210.0	113.4	12.9
16 T I H A L I O C C	X	X	X	X	X	X	2	X	X	X						10.3	110.0	10.9	10.2
17 H I E R A L I A N	X	X	X	X	X	X	3	X	X	X						15.3	210.0	123.7	15.1
18																1.0	1.0	465.1	1.0
19																1.0	1.0	1.0	1.0
20																1.0	1.0	1.0	1.0
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	6	7	7	7	7	7	6	5	6	7						910.3	1.0	1.0	1.0
EXPOSED SOIL	2	1	1	1	1	1	2	4	2	1						14.8	1.0	1.0	1.0
MOSS & LICHEN	1	1	1	1	1	1	1	1	1	1						10.5	1.0	1.0	1.0
BROWSE UTILIZATION FORM	SUBTOTALS (bring subtotal forward from continuation form)															1.0	1.0	1.0	1.0
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	TOTAL															1.0	1.0	1.0	1.0
RANGE CONDITION FIELD ESTIMATE	CALCULATED RANGE CONDITION															RANGE CONDITION _____ %			
<input type="checkbox"/> E <input type="checkbox"/> G <input checked="" type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP	<input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP																		

DAUBENMIRE - COVER CLASS	1	2	3	4	5	6	7
MIDPOINTS	0.5	2.5	15.0	37.5	62.5	85.0	97.5
RANGES	0.1	1.5	5.25	25.50	50.75	75.75	99.75

<input type="checkbox"/> Primary <input checked="" type="checkbox"/> Secondary <input type="checkbox"/> Non Use			<input type="checkbox"/> U <input checked="" type="checkbox"/> L <input type="checkbox"/> M <input type="checkbox"/> H			(EST.) % VIGOUR: <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P	
WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS	DENSITY DISTRIBUTION
1 PO. PUTRE	8	7.0	6.0 - 8.0	95		2	A few sporadically occurring individuals
2 RUB. IIDA	8	1.0	0.5 - 1.2	65		3	A single patch or clump of a species
3						4	Several sporadically occurring individuals
4						5	A few patches or clumps of a species
5						6	Several well spaced patches or clumps
6						7	Continuous uniform occurrence of well spaced individuals
7						8	Continuous occurrence of a species with a few gaps in the distribution
8						9	Continuous dense occurrence of a species
TOTAL SHRUB COVER		FOREST COVER		COMMENTS:			
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS					
SUB DOMINANT							
POISONOUS PLANTS				% AREA COVER	DENSITY DIST. CLASS	WEEDS	
SPECIES		PHOTO GRID LOCATION				SPECIES	
1						1	
2						2	
3						3	

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE

☐ creek ☐ dugout ☐ trough ☐ slough ☐ lake/pond ☐ other (specify) _____

PHOTO GRID LOCATION ☐ Required ☐ Not Required Distance (km) _____

Water Quality/Access (specify) _____

SALT SOURCE

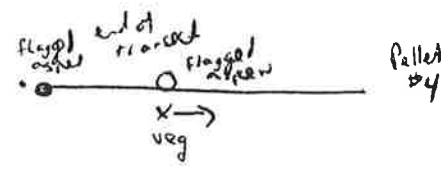
☐ Natural ☐ Block ☐ Bag ☐ Other (specify) _____

PHOTO GRID LOCATION _____

ACCESS (CATTLE)

☐ G ☐ F ☐ P ☐ truck trail ☐ road ☐ seismic ☐ game trail ☐ valley bottom ☐ other (specify) _____

COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE

DISPOSITION/ALLOTMENT CARBONDALE				FIELD/DU "control"		SITE NO. B.L.K.B		POLYGON NO.		YR MO DAY 99 08 15		EXAMINER ST/MP	
RANGE TYPE LS		SEC 0699710		TWP N 478350		RGE M		SLOPE (%) 140		ASPECT SSW		ELEVATION (M) 1544	
POLYGON GEOMORPHIC DESCRIPTION NAD21				TERRAIN PROFILE AND NOTES - heavily utilized by cattle 				SITE DESCRIPTION (Circle one in each column)					
GENETIC CODE: SURFACE EXP.				TEXTURE		REGIONAL LANDFORM Mountains		LOCAL LANDFORM		LANDFORM ELEMENT			
								Hilly		Mid-slope			
						Hills		Steep Slopes		Crest			
						Uplands		Rolling		Upper Slope			
						Midlands		Hummocky		Lower Slope			
						Lowlands		Ridged		Terrace			
						Valleys		Plain		Level			
										Depression			
SLOPE/ASPECT				SOIL DRAINAGE				PRODUCTION (lb./ac)					
PHOTOS TAKEN Roll: 4 Number: 25-21				<input type="checkbox"/> MACROPLOT 10m ² <input checked="" type="checkbox"/> MICROPLOT .1m ² <input type="checkbox"/> Other _____ m ²				ESTIMATED _____ FORAGE <input type="checkbox"/> CLIPPED _____ BRUSH <input type="checkbox"/>					

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 GIERATVILIS	3	2	x	3	x	x	2	5	1	1						9.9	70.0	8.2	2.8
2 EICHTIUM	4	x	x	x	x	x	x	x	x	x						13.8	10.0	1.2	3.0
3 VILLOLIA	2	x	x	x	x	x	x	x	3	x						11.8	20.0	1.8	2.0
4 AGRIOTIRIA	2	x	2	x	x	x	x	x	x	x						10.5	20.0	1.2	0.5
5 PHILIPRA	2	2	2	3	2	3	3	3	3	3						110.0	100.0	110.0	24.9
6 LATIHIOKH	2	x	2	2	x	x	x	x	x	x						10.8	30.0	1.4	1.1
7 SIOHIDIA	4	x	x	x	x	x	x	x	x	x						13.8	10.0	1.2	3.0
8 GALIBIOR	1	x	x	x	1	x	x	x	3							11.6	30.0	1.8	2.2
9 BIRUMINE	2	x	x	x	x	x	x	x	x	x						10.3	10.0	1.0	0.2
10 THIALOIC	x	2	1	1	x	1	x	x	x	x						10.4	40.0	1.2	0.6
11 ANGLEARG	x	1	x	x	x	x	x	x	2	x						10.3	20.0	1.3	0.3
12 FIRAGVIR	x	2	1	2	3	x	1	3	3	2						15.4	80.0	4.8	12.0
13 PIELISP	x	2	2	x	x	x	1	x	x	x						10.6	30.0	1.3	0.8
14 ERIGISPE	x	2	x	4	x	4	3	2	x	x						19.5	50.0	6.7	16.7
15 TRILSITI	x	2	x	3	3	x	x	x	x	x						13.3	30.0	1.8	4.5
16 ACHIMIL	x	x	2	1	1	2	x	1	2	3						12.4	70.0	2.0	15.0
17 GEUMMAC	x	x	3	x	x	x	x	x	x	x						11.5	10.0	1.4	1.2
18 FIORBI	2	x	x	x	x	x	x	x	x	3						11.5	10.0	1.4	1.2
19																		401.3	
20																			
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	6	6	6	6	6	7	5	6	6	6						84.0			
EXPOSED SOIL	2	1	2	2	1	1	3	2	2	2						13.2			
MOSS & LICHEN	1	1	1	1	1	1	1	1	1	1						10.5			
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)															1	1	1	1
	TOTAL															1	1	1	1
RANGE CONDITION FIELD ESTIMATE <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input checked="" type="checkbox"/> P <input type="checkbox"/> VP	CALCULATED RANGE CONDITION <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP										RANGE CONDITION _____ %								

DAUBENMIRE - COVER CLASS
MIDPOINTS

1 2 3 4 5 6 7
0.5 2.5 15.0 37.5 62.5 85.0 97.5

<input checked="" type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Non Use			<input type="checkbox"/> U <input type="checkbox"/> L <input type="checkbox"/> M <input checked="" type="checkbox"/> H			(EST.) % VIGOUR: <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input checked="" type="checkbox"/> P	
WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS	DENSITY DISTRIBUTION
1 PROP. UTRE	1	16.0	—	100	400	2	A few sporadically occurring individuals
2 SYMP. DIC	3	0.4	0.2-0.5	5	—	3	A single patch or clump of a species
3						4	Several sporadically occurring individuals
4						5	A few patches or clumps of a species
5						6	Several well spaced patches or clumps
6						7	Continuous uniform occurrence of well spaced individuals
7						8	Continuous occurrence of a species with a few gaps in the distribution
8						9	Continuous dense occurrence of a species
TOTAL SHRUB COVER		FOREST COVER		COMMENTS: - Mature Aw scattered in clumps throughout meadow.			
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS					
SUB DOMINANT							
POISONOUS PLANTS				% AREA COVER	DENSITY DIST. CLASS	WEEDS	
SPECIES		PHOTO GRID LOCATION				SPECIES	
1						1	
2						2	
3						3	

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE

☐ creek ☐ dugout ☐ trough ☐ slough ☐ lake/pond ☐ other (specify)

PHOTO GRID LOCATION

☐ Required ☐ Not Required Distance (km)

Water Quality/ Access (specify)

SALT SOURCE

☐ Natural ☐ Block ☐ Bag ☐ Other (specify)

PHOTO GRID LOCATION

ACCESS (CATTLE)

☐ G ☐ F ☐ P ☐ truck trail ☐ road ☐ seismic ☐ game trail ☐ valley bottom ☐ other (specify)

COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE

DISPOSITION/ALLOTMENT CARBONDALE				FIELD/DU Treatment		SITE NO. B.L.K. B		POLYGON NO.		YR MO DAY 99 08 15		EXAMINER PI/MP	
RANGE TYPE LS		SEC 06 09 00		TWP N 54 18 34 S		RGE M		SLOPE (%) 20°		ASPECT SSW		ELEVATION (MI) 1460	
POLYGON GEOMORPHIC DESCRIPTION NAD 27				TERRAIN PROFILE AND NOTES Rebar start of veg transect → towards start of pellet.				SITE DESCRIPTION (Circle one in each column)					
GENETIC CODE SURFACE EXP				TEXTURE				REGIONAL LANDFORM Mountains		LOCAL LANDFORM Steep Slopes		LANDFORM ELEMENT Crest	
								Hills		Hilly		Upper Slope	
SLOPE/ASPECT				SOIL SOIL DRAINAGE				Uplands		Rolling		Mid-slope	
								Midlands		Hummocky		Lower Slope	
PHOTOS TAKEN Roll: 4 Number: 20-17				Description:				Lowlands		Ridged		Terrace	
								Valleys		Plain		Level	
<input type="checkbox"/> MACROPLOT 10m² <input checked="" type="checkbox"/> MICROPLOT .1m² <input type="checkbox"/> Other _____ m²				PRODUCTION (lb./ac) ESTIMATED CLIPPED _____ FORAGE <input type="checkbox"/> BRUSH <input type="checkbox"/>				Depression					

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 AISTECON	2	2	X	3	2	3	2	3	X	X						15.5	710.0	146.0	20.7
2 LIATHOICH	3	3	X	2	X	X	X	3	X	X						14.8	410.0	130.4	13.7
3 PIEALISP	2	X	X	X	X	X	1	3	3	X						13.3	410.0	120.9	9.4
4 AGRIOTRA	X	X	2	X	X	X	2	X	X	X						10.5	210.0	2.2	1.0
5 TIRISIT	3	2	1	2	2	2	X	X	1	3						14.1	810.0	136.7	16.5
6 FIRAGVIR	X	2	X	3	2	1	X	2	1	X						12.4	610.0	118.6	18.4
7 GERAVIC	X	X	1	X	X	X	X	X	X	X						10.1	110.0	10.3	10.1
8 THALIOCC	X	X	X	2	X	2	3	2	X	X						12.3	410.0	114.5	16.5
9 ANGTEARIS	X	X	X	X	2	2	2	4	X	2						14.8	510.0	133.9	15.2
10 EIRIGSIE	X	X	X	X	3	X	3	X	X	X						13.0	210.0	113.4	16.0
11 TARLAOFIE	X	X	X	X	X	X	2	X	X	X						10.3	110.0	10.9	10.4
12 VILIOLIA	2	X	X	X	X	X	X	X	X	3						1.5	110.0	14.7	2.1
13																.	.	222.5	.
14																.	.	.	.
15																.	.	.	.
16																.	.	.	.
17																.	.	.	.
18																.	.	.	.
19																.	.	.	.
20																.	.	.	.
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	6	4	4	3	4	3	3	6	5	4						42.8	.	.	.
EXPOSED SOIL / slash	2	5	5	6	5	6	6	2	4	5						54.8	.	.	.
MOSS & LICHEN	1	1	1	1	1	1	1	1	1	1						10.5	.	.	.
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)										TOTAL					.	.	.	.
RANGE CONDITION FIELD ESTIMATE <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input checked="" type="checkbox"/> P <input type="checkbox"/> VP	CALCULATED RANGE CONDITION <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP										RANGE CONDITION _____ %					.	.	.	.

DAUBENMIRE - COVER CLASS
MIDPOINTS
RANGES

1	2	3	4	5	6	7
0.5	2.5	15.0	37.5	62.5	85.0	97.5
0-1	1-5	5-25	25-50	50-75	75-85	85-100

DISPOSITION/ALLOTMENT CARBONDALE		FIELD/DU	SITE NO. B.L.K.C	POLYGON NO.	YR 99	MO 08	DAY 14	EXAMINER PJ/MP
RANGE TYPE 110^{LS} E 06^{SEC} 09^{TWP} N 5^{RGE} 47³⁸ 38	SLOPE (%)		ASPECT SSW	ELEVATION (M) 1538	AIR PHOTO NO. AS		NO.	

POLYGON GEOMORPHIC DESCRIPTION		TERRAIN PROFILE AND NOTES		SITE DESCRIPTION (Circle one in each column)	
GENETIC CODE: SURFACE EXP.	TEXTURE			REGIONAL LANDFORM Mountains	LOCAL LANDFORM Hilly
				LANDFORM ELEMENT Upper Slope	
				Steepest Slopes	
				Rolling	
				Hummocky	
				Lowlands	Ridged
				Valleys	Plain
					Depression

SLOPE/ASPECT	SOIL/ SOIL DRAINAGE
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PHOTOS TAKEN Roll: 2 Number: 31	<input type="checkbox"/> MACROPLOT 10m ² <input type="checkbox"/> MICROPLOT .1m ² <input type="checkbox"/> Other _____ m ²	PRODUCTION (lb./ac) ESTIMATED _____ FORAGE <input type="checkbox"/> CLIPPED _____ BRUSH <input type="checkbox"/>
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SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 ERIGOSPE	4	3	X	4	4	3	4	4	4							29.3	90.0	1278.0	29.1
2 THALLOIC	3	2	2	2	3	3	X	X	X	X						15.3	60.0	141.1	4.3
3 ASTEICOINX	2	4	3	X	X	X	X	X	X							15.5	30.0	130.1	3.2
4 PHILIPPIA	4	3	3	X	3	4	3	3	4	2						19.0	90.0	1180.2	18.9
5 EPIILLIANG	X	X	X	X	X	X	X	2	4	X						4.0	20.0	117.9	1.9
6 ECHILUM	X	X	X	X	X	X	X	X	5	X						16.3	10.0	119.9	2.1
7 AKATHIMIL	3	2	2	X	1	2	4	3	2	3						9.3	90.0	188.2	9.2
8 PEAISIP	1	2	2	2	1	X	2	2	X	2						1.6	80.0	114.3	1.5
9 FRAIGVIR	1	X	2	3	3	4	1	1	1	2						7.5	90.0	171.2	7.5
10 CIERIAISP	2	X	X	X	X	X	X	X	X	X						10.3	10.0	110.9	10.1
11 GIERIAUIS	X	4	3	X	3	4	2	X	5							17.0	60.0	1131.7	13.8
12 GALLIBOIR	X	2	3	2	X	2	2	X	X	2						2.8	60.0	121.9	2.3
13 SEINETRI	X	3	X	X	X	X	X	X	X	X						1.5	10.0	14.7	0.5
14 SUMISUA	X	3	2	X	X	X	X	X	X	X						1.6	20.0	17.2	0.8
15 AGROTRA	X	2	X	X	X	X	X	X	X	3						1.8	20.0	18.0	0.8
16 BROMINIE	X	2	2	X	X	2	X	X	X	X						10.8	30.0	14.4	10.5
17 POAIPRA	X	2	X	X	X	X	X	X	X	X						10.3	10.0	110.9	10.1
18 TIRISIEIT	X	X	4	3	X	X	X	X	X	X						15.3	20.0	123.7	12.5
19 ANIGEARIG	X	X	X	X	3	X	X	X	X	X						1.5	10.0	14.7	10.5
20 CASITISP	X	X	X	X	X	X	3	X	X	X						1.5	10.0	14.7	10.5
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	4	7	7	4	7	6	6	7	6							810.5		953.7	
EXPOSED SOIL /slush	4	1	1	5	1	2	2	1	2							11.2			
MOSS & LICHEN	1	1	1	1	1	1	1	1	1							10.5			
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)																		
	TOTAL																		

RANGE CONDITION FIELD ESTIMATE <input type="checkbox"/> E <input type="checkbox"/> G <input checked="" type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP	CALCULATED RANGE CONDITION <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP	RANGE CONDITION _____ %
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DAUBENMIRE - COVER CLASS	1	2	3	4	5	6	7
MIDPOINTS	0.5	2.5	15.0	37.5	62.5	85.0	97.5
RANGES	0 - 1	1 - 5	5 - 25	25 - 50	50 - 75	75 - 95	95 - 100

RANGE USE CATEGORY <input type="checkbox"/> Primary <input checked="" type="checkbox"/> Secondary <input type="checkbox"/> Non Use			GRAZING INTENSITY TEST, LONG TERM <input type="checkbox"/> U <input checked="" type="checkbox"/> L <input type="checkbox"/> M <input type="checkbox"/> H			CURRENT UTILIZATION (EST.) %		VIGOUR: <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P	
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WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS DENSITY DISTRIBUTION	
1 POPULTR	7	0.5	0.3-0.6	2.0		1 Rare individual, a single occurrence	.
2 SYMPOCC	5	0.4	0.3-0.4	1.0		2 A few sporadically occurring individuals	. . .
3		.	. - .			3 A single patch or clump of a species	...
4		.	. - .			4 Several sporadically occurring individuals	...
5		.	. - .			5 A few patches or clumps of a species	...
6		.	. - .			6 Several well spaced patches or clumps	...
7		.	. - .			7 Continuous uniform occurrence of well spaced individuals	...
8		.	. - .			8 Continuous occurrence of a species with a few gaps in the distribution	...
9		.	. - .			9 Continuous dense occurrence of a species	...

TOTAL SHRUB COVER		FOREST COVER	COMMENTS:	HEIGHT CLASS DISTRIBUTION CODE (m) 91 = 0 - 0.5 92 = 0.5 - 1 93 = 1 - 3 94 = 3 - 6
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS		
SUB DOMINANT				

POISONOUS PLANTS		% AREA COVER	DENSITY DIST. CLASS	WEEDS		% AREA COVER	DENSITY DIST. CLASS
SPECIES	PHOTO GRID LOCATION			SPECIES	PHOTO GRID LOCATION		
1				1			
2				2			
3				3			

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE <input type="checkbox"/> creek <input type="checkbox"/> dugout <input type="checkbox"/> trough <input type="checkbox"/> slough <input type="checkbox"/> lake/pond <input type="checkbox"/> other (specify) _____	
PHOTO GRID LOCATION <input type="checkbox"/> Required <input type="checkbox"/> Not Required Distance (km) _____	Water Quality/Access (specify) _____
SALT SOURCE <input type="checkbox"/> Natural <input type="checkbox"/> Block <input type="checkbox"/> Bag <input type="checkbox"/> Other (specify) _____	
PHOTO GRID LOCATION _____	
ACCESS (CATTLE) <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> truck trail <input type="checkbox"/> road <input type="checkbox"/> seismic <input type="checkbox"/> game trail <input type="checkbox"/> valley bottom <input type="checkbox"/> other (specify) _____	

COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE

SECTION/ALLOTMENT			FIELD/DO	SITE NO.	POLYGON NO.	YR	MO	DAY	EXAMINER
CARBONDALE					B.L.R.D.	99	08	14	RJ/MP
RANGE TYPE	LS	SEC	TWP	RGE	M	SLOPE (%)		ASPECT	ELEVATION (m)
	110	E06	70523N	5477535		16°		SSW	1416
POLYGON GEOMORPHIC DESCRIPTION					TERRAIN PROFILE AND NOTES				
GENETIC CODE: NAD27 SURFACE EXP.					TEXTURE 				
SLOPE/ASPECT PHOTOS TAKEN Roll: 4 Description: Number: 36-32					SOIL/ SOIL DRAINAGE <input type="checkbox"/> MACROPLOT 10m ² <input checked="" type="checkbox"/> MICROPLOT .1m ² <input type="checkbox"/> Other _____ m ²				
REGIONAL LANDFORM <input checked="" type="radio"/> Mountains Hills Uplands Midlands Lowlands Valleys					LOCAL LANDFORM Steep Slopes <input checked="" type="radio"/> Hill Rolling Hummocky Ridged Plain				
SITE DESCRIPTION (Circle one in each column) Crest Upper Slope <input checked="" type="radio"/> Mid-slope Lower Slope Terrace Level Depression					PRODUCTION (lb./ac) ESTIMATED CLIPPED				
FORAGE <input type="checkbox"/> BRUSH <input type="checkbox"/>									

<

<input type="checkbox"/> Primary <input checked="" type="checkbox"/> Secondary <input type="checkbox"/> Non Use		<input type="checkbox"/> U <input checked="" type="checkbox"/> L <input type="checkbox"/> M <input type="checkbox"/> H		(EST.)		%		VIGOUR: <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P	
WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS DENSITY DISTRIBUTION			
1 PROPIETRE	6	0.6	0.1-0.9	4.0		1 Rare individual, a single occurrence		•	
2 RUBU	7	0.3	0.1-0.4	5.5		2 A few sporadically occurring individuals		• •	
3		•	• - •			3 A single patch or clump of a species		• • •	
4		•	• - •			4 Several sporadically occurring individuals		• • •	
5		•	• - •			5 A few patches or clumps of a species		• • •	
6		•	• - •			6 Several well spaced patches or clumps		• • •	
7		•	• - •			7 Continuous uniform occurrence of well spaced individuals		• • •	
8		•	• - •			8 Continuous occurrence of a species with a few gaps in the distribution		• • •	
9		•	• - •			9 Continuous dense occurrence of a species		• • •	
TOTAL SHRUB COVER		FOREST COVER		COMMENTS: - Aw has been browsed lightly					
DOMINANT	HEIGHT CLASS	DENSITY DIST CLASS							
SUB DOMINANT									
POISONOUS PLANTS				% AREA COVER	DENSITY DIST CLASS	WEEDS		% AREA COVER	DENSITY DIST CLASS
SPECIES		PHOTO GRID LOCATION				SPECIES		PHOTO GRID LOCATION	
1						1			
2						2			
3						3			

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE	
<input type="checkbox"/> creek <input type="checkbox"/> dugout <input type="checkbox"/> trough <input type="checkbox"/> slough <input type="checkbox"/> lake/pond <input type="checkbox"/> other (specify) _____	
PHOTO GRID LOCATION	<input type="checkbox"/> Required <input type="checkbox"/> Not Required Distance (km) _____
Water Quality/Access (specify) _____	
SALT SOURCE	
<input type="checkbox"/> Natural <input type="checkbox"/> Block <input type="checkbox"/> Bag <input type="checkbox"/> Other (specify) _____	
PHOTO GRID LOCATION	
ACCESS (CATTLE)	
<input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> truck trail <input type="checkbox"/> road <input type="checkbox"/> seismic <input type="checkbox"/> game trail <input type="checkbox"/> valley bottom <input type="checkbox"/> other (specify) _____	

COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE

DISPOSITION/ALLOTMENT: CARBONDALE FIELD/DU: T.B.L.K.E. SITE NO: POLYGON NO: YR: 99 MO: 08 DAY: 15 EXAMINER: PJ/MP

RANGE TYPE: 11U 8689896 N 5448371 RGE: M SLOPE (%): 120 ASPECT: S ELEVATION (m): 1550 AIR PHOTO NO: AS NO:

POLYGON GEOMORPHIC DESCRIPTION: GENETIC CODE: SURFACE EXP: TEXTURE: TERRAIN PROFILE AND NOTES: SITE DESCRIPTION (Circle one in each column)

REGIONAL LANDFORM: Mountains Hills Uplands Midlands Lowlands Valleys LOCAL LANDFORM: Steep Slopes Hilly Rolling Hummocky Ridged Plain LANDFORM ELEMENT: Crest Upper Slope Mid-slope Lower Slope Terrace Level Depression

SLOPE/ASPECT: Roll: 4 Number: 16-13 Description: ☐ MACROPLOT 10m² ☒ MICROPLOT .1m² ☐ Other _____ m² PRODUCTION (lb./ac) ESTIMATED CLIPPED: FORAGE ☐ BRUSH ☐

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 FIORBIZ	3	4	1	1	x	x	2	2	3	x						17.4	70.0	161.9	11.5
2 ACHIMILIL	1	x	x	1	2	x	1	1	1	2						10.8	70.0	16.7	1.2
3 PLOITIGIRA	3	2	x	1	x	x	x	x	x	x						11.8	30.0	19.9	1.8
4 ALILICIER	2	x	x	x	x	x	x	x	x	x						10.3	10.0	10.9	0.2
5 GAILIBOIR	2	x	x	x	1	x	x	3	1							11.9	40.0	112.0	12.2
6 ANITENEG	3	x	2	x	x	x	x	3	3							14.8	40.0	130.4	15.6
7 DIANTINIT	4	5	4	5	4	x	x	x	x							213.8	50.0	1168.3	31.2
8 DEISCICAE	x	x	4	x	x	x	x	4	3	x						19.0	30.0	149.3	19.1
9 PHILEPIA	2	x	3	x	3	4	2	2	x	3						19.0	70.0	175.3	14.0
10 FIORB?	x	3														1.0	1.0	1.0	1.0
11 CIAMPIROT	x	3	x	1	x	3	1	2	x	x						13.4	50.0	124.0	14.5
12 EIRIGSPFE	x	x	x	3	3	x	3	4	x	x						18.3	40.0	152.5	19.7
13 FEISICUFE	x	x	x	x	x	2	3	x	x	x						11.8	20.0	18.0	1.5
14 GEFUMTIR	x	x	x	x	x	x	3	2	x	1						11.8	30.0	9.9	1.8
15 VILLOLIA	x	x	x	x	x	x	x	2	x	x						10.3	10.0	10.9	0.2
16 ANIEMMVL	x	x	x	x	x	x	x	3	x							11.5	10.0	14.7	0.9
17 SIP131	x	x	x	x	x	x	x	x	x	5						16.3	10.0	119.9	13.7
18 AISICILISP	x	x	x	x	x	x	x	x	x	3						11.5	10.0	14.7	0.9
19																1.0	1.0	539.3	1.0
20																1.0	1.0		1.0
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	7	7	7	7	6	6	6	6	7	7						912.5	1.0		1.0
EXPOSED SOIL	1	1	1	1	2	3	1	3	1	1						13.6	1.0		1.0
MOSS & LICHEN	1	1	1	1	1	2	1	1	1	1						10.7	1.0		1.0
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)															1.0	1.0		1.0
	TOTAL															1.0	1.0		1.0
RANGE CONDITION FIELD ESTIMATE <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP	CALCULATED RANGE CONDITION <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP															RANGE CONDITION _____ %			

DAUBENMIRE - COVER CLASS	1	2	3	4	5	6	7
MIDPOINTS	0.5	2.5	15.0	37.5	62.5	85.0	97.5
RANGES	0.1	1.5	5.25	25.50	50.25	75.75	99.75

WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT m	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS	DENSITY DISTRIBUTION	
1 SALIX	2	0.1	—	3		2	A few sporadically occurring individuals	.
2		.	—			3	A single patch or clump of a species	.
3		.	—			4	Several sporadically occurring individuals	.
4		.	—			5	A few patches or clumps of a species	.
5		.	—			6	Several well spaced patches or clumps	.
6		.	—			7	Continuous uniform occurrence of well spaced individuals	.
7		.	—			8	Continuous occurrence of a species with a few gaps in the distribution	.
8		.	—			9	Continuous dense occurrence of a species	.

TOTAL SHRUB COVER		FOREST COVER	COMMENTS:	HEIGHT CLASS DISTRIBUTION CODE (m) 91 = 0 - 0.5 92 = 0.5 - 1 93 = 1 - 3 94 = 3 - 6
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS		
SUB DOMINANT				

POISONOUS PLANTS		% AREA COVER	DENSITY DIST. CLASS	WEEDS		% AREA COVER	DENSITY DIST. CLASS
SPECIES	PHOTO GRID LOCATION			SPECIES	PHOTO GRID LOCATION		
1				1			
2				2			
3				3			

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE	
<input type="checkbox"/> creek <input type="checkbox"/> dugout <input type="checkbox"/> trough <input type="checkbox"/> slough <input type="checkbox"/> lake/pond <input type="checkbox"/> other (specify) _____	
PHOTO GRID LOCATION	<input type="checkbox"/> Required <input type="checkbox"/> Not Required Distance (km) _____
Water Quality/Access (specify) _____	
SALT SOURCE	
<input type="checkbox"/> Natural <input type="checkbox"/> Block <input type="checkbox"/> Bag <input type="checkbox"/> Other (specify) _____	
PHOTO GRID LOCATION	
ACCESS (CATTLE)	
<input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> truck trail <input type="checkbox"/> road <input type="checkbox"/> seismic <input type="checkbox"/> game trail <input type="checkbox"/> valley bottom <input type="checkbox"/> other (specify) _____	
COMMENTS CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE	

DISPOSITION/ALLOTMENT: CARBONDALE FIELD/DU: SITE NO: B.L.K.1 POLYGON NO.: 99/08/20 YR: 99 MO: 08 DAY: 20 EXAMINER: PJ/MP

RANGE TYPE: LS 110 0691648 SEC: N. 5478159 TWP: NAD 27 SLOPE (°): 28° ASPECT: SSW ELEVATION (m): 1686 AIR PHOTO NO: AS NO:

POLYGON GEOMORPHIC DESCRIPTION: TERRAIN PROFILE AND NOTES: SITE DESCRIPTION (Circle one in each column)

REGIONAL LANDFORM	LOCAL LANDFORM	LANDFORM ELEMENT
<input checked="" type="radio"/> Mountains	<input type="radio"/> Steep Slopes	<input type="radio"/> Crest
<input type="radio"/> Hills	<input checked="" type="radio"/> Hilly	<input checked="" type="radio"/> Upper Slope
<input type="radio"/> Uplands	<input type="radio"/> Rolling	<input type="radio"/> Mid-slope
<input type="radio"/> Midlands	<input type="radio"/> Hummocky	<input type="radio"/> Lower Slope
<input type="radio"/> Lowlands	<input type="radio"/> Ridged	<input type="radio"/> Terrace
<input type="radio"/> Valleys	<input type="radio"/> Plain	<input type="radio"/> Level
		<input type="radio"/> Depression

GENETIC CODE: SURFACE EXP: TEXTURE: SOIL: SOIL DRAINAGE:

PHOTOS TAKEN Roll: 6 Number: 11-1 Description: ☐ MACROPLOT 10m² ☒ MICROPLOT .1m² ☐ Other _____ m²

PRODUCTION (lb./ac) ESTIMATED CLIPPED: FORAGE ☐ BRUSH ☐

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM. VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 CAMP. ROT	3	3	2	2	x	2	x	2	3	x						15.5	70.0	146.0	211.2
2 AGRIOSPI	4	2	x	3	3	4	x	3	2	3						14.0	80.0	112.5	517.7
3 ACITIMIL	x	2	x	x	x	1	x	1	x	x						10.4	30.0	112.2	11.0
4 KIOELMAC	x	2	3	x	2	x	x	x	x	x						12.0	30.0	111.0	15.1
5 LUPISEIR	x	x	3	x	x	x	x	x	x	x						11.5	110.0	114.7	12.2
6 ANTIENN	x	x	x	2	x	x	x	x	x	x						10.3	110.0	110.9	10.4
7 PEIAISP	x	x	x	3	x	x	x	x	x	x						11.5	110.0	114.7	12.2
8 SEDIVILAN	x	x	x	x	2	x	x	1	x	x						10.3	20.0	11.3	10.6
9 AGRIOSICIA	x	x	x	x	1	x	x	x	x	x						10.1	110.0	110.3	10.1
10 TIARIAOFIF	x	x	x	x	x	1	x	x	x	x						10.1	110.0	110.3	10.1
11 GAILIARII	x	x	x	x	x	1	1	x	x	x						10.1	210.0	110.4	10.2
12 FIEISICUEI	x	x	x	x	x	x	5	x	x	x						16.3	110.0	119.9	19.2
13																		216.9	
14																			
15																			
16																			
17																			
18																			
19																			
20																			
LITTER <input type="checkbox"/> TOTAL VEGETATION <input checked="" type="checkbox"/>	5	3	4	4	3	5	5	3	3	3						33.8			
EXPOSED SOIL *	4	6	5	5	6	5	3	5	6	6						64.3			
MOSS & LICHEN	1	1	1	1	1	1	1	1	1	1						10.5			
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)																		
	TOTAL																		
RANGE CONDITION FIELD ESTIMATE <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input checked="" type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP	CALCULATED RANGE CONDITION <input type="checkbox"/> E <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> VP															RANGE CONDITION _____ %			

DAUBENMIRE - COVER CLASS MIDPOINTS

1	2	3	4	5	6	7
0.5	2.5	15.0	37.5	62.5	85.0	97.5

<input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input checked="" type="checkbox"/> Non Use		<input checked="" type="checkbox"/> U <input type="checkbox"/> L <input type="checkbox"/> M <input type="checkbox"/> H		(EST.) % VIGOUR: <input type="checkbox"/> E <input checked="" type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P				
WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS DENSITY DISTRIBUTION		
1 S.P. 1. R.B.E.T	4	0.1	—	1.5		1 Rare individual, a single occurrence	•	
2		•	• — •			2 A few sporadically occurring individuals	• • •	
3		•	• — •			3 A single patch or clump of a species	• • •	
4		•	• — •			4 Several sporadically occurring individuals	• • •	
5		•	• — •			5 A few patches or clumps of a species	• • •	
6		•	• — •			6 Several well spaced patches or clumps	• • •	
7		•	• — •			7 Continuous uniform occurrence of well spaced individuals	• • •	
8		•	• — •			8 Continuous occurrence of a species with a few gaps in the distribution	• • •	
9		•	• — •			9 Continuous dense occurrence of a species	• • •	
TOTAL SHRUB COVER		FOREST COVER		COMMENTS:			HEIGHT CLASS DISTRIBUTION CODE (m) 91 = 0 - 0.5 92 = 0.5 - 93 = 1 - 3 94 = 3 - 6	
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS						
SUB DOMINANT								
POISONOUS PLANTS			% AREA COVER	DENSITY DIST. CLASS	WEEDS		% AREA COVER	DENSITY DIST. CLASS
SPECIES		PHOTO GRID LOCATION			SPECIES		PHOTO GRID LOCATION	
1					1			
2					2			
3					3			

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE <input type="checkbox"/> creek <input type="checkbox"/> dugout <input type="checkbox"/> trough <input type="checkbox"/> slough <input type="checkbox"/> lake/pond <input type="checkbox"/> other (specify) _____	
PHOTO GRID LOCATION <input type="checkbox"/> Required <input type="checkbox"/> Not Required Distance (km) _____	
Water Quality/ Access (specify) _____	
SALT SOURCE <input type="checkbox"/> Natural <input type="checkbox"/> Block <input type="checkbox"/> Bag <input type="checkbox"/> Other (specify) _____	
PHOTO GRID LOCATION _____	
ACCESS (CATTLE) <input type="checkbox"/> G <input type="checkbox"/> F <input type="checkbox"/> P <input type="checkbox"/> truck trail <input type="checkbox"/> road <input type="checkbox"/> seismic <input type="checkbox"/> game trail <input type="checkbox"/> valley bottom <input type="checkbox"/> other (specify) _____	
COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE	

DISPOSITION/ALLOTMENT CAR BOUND ALE				FIELD/DU		SITE NO. B.LK 2		POLYGON NO.		YR MO DAY 99/08/20		EXAMINER PJ/MP					
RANGE TYPE		LS 110 E	SEC 06	TWP 15	RGE 30 N	M 54	SLOPE (%)	ASPECT 24°	ELEVATION (m) SSN 1773		AIR PHOTO NO AS		NO.				
POLYGON GEOMORPHIC DESCRIPTION						TERRAIN PROFILE AND NOTES				SITE DESCRIPTION (Circle one in each column)							
GENETIC CODE SURFACE EXP <div style="text-align: center; height: 100px;"> </div>										REGIONAL LANDFORM <input checked="" type="radio"/> Mountains Hills Uplands Midlands Lowlands Valleys				LOCAL LANDFORM Steep Slopes <input checked="" type="radio"/> Rolling Hummocky Ridged Plain		LANDFORM ELEMENT Crest <input checked="" type="radio"/> Upper Slope <input checked="" type="radio"/> Mid-slope Lower Slope Terrace Level Depression	
										ESTIMATED CLIPPED				PRODUCTION (lb./ac)				FORAGE ☐		BRUSH ☐
SLOPE/ASPECT PHOTOS TAKEN Roll: <u>6</u> Number: <u>4-1</u> Description:						<input type="checkbox"/> MACROPLOT 10m ² <input checked="" type="checkbox"/> MICROPLOT .1m ² <input type="checkbox"/> Other _____ m ²											

SPECIES	PLOT NUMBER															AVERAGE COVER	% COMP.	PROM. VALUE	% PROM VALUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
1 <i>AGRIOSIP</i>	x	x	x	x	x	x	x	x	x	x						13.5	40.0	122.1	612.4
2 <i>CIAMPIROT</i>	x	x	x	x	x	x	x	x	x	x						10.1	110.0	10.3	10.8
3 <i>AGIOSIGLA</i>	x	x	x	x	x	x	x	x	x	x						10.1	110.0	10.3	10.8
4 <i>AICHIIMIL</i>	x	x	x	x	x	x	x	x	x	x						11.5	110.0	14.7	113.3
5 <i>FEISICUIE</i>	x	x	x	x	x	x	x	x	x	x						11.8	210.0	18.0	212.6
6 <i>Western Fescue (F. occidentalis) + another one</i>																.	.	35.4	.
7																.	.	.	.
8																.	.	.	.
9																.	.	.	.
10																.	.	.	.
11																.	.	.	.
12																.	.	.	.
13																.	.	.	.
14																.	.	.	.
15																.	.	.	.
16																.	.	.	.
17																.	.	.	.
18																.	.	.	.
19																.	.	.	.
20																.	.	.	.
LITTER <input checked="" type="checkbox"/> TOTAL VEGETATION	3	3	3	5	3	2	3	3	3	3						118.5	.	.	.
EXPOSED SOIL *	6	6	6	5	6	7	6	6	6	6						814.0	.	.	.
MOSS & LICHEN	1	1	1	1	1	1	1	1	1	1						10.5	.	.	.
BROWSE UTILIZATION FORM <input type="checkbox"/> YES <input type="checkbox"/> NO	SUBTOTALS (bring subtotal forward from continuation form)															.	.	.	.
	TOTAL															.	.	.	.

DAUBENMIRE - COVER CLASS MIDPOINTS

1	2	3	4	5	6	7
0.5	2.5	15.0	37.5	62.5	85.0	97.5

WOODY SPECIES		DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)	CLASS	DENSITY DISTRIBUTION	
1 P.O.P. UTRE		9	1.5	1.0-2.0	9.5	—	2	A few sporadically occurring individuals	.
2 SPIRIBET		4	0.1	—	1.0	—	3	A single patch or clump of a species	.
3 ROSAWO		2	0.1	—	0.5	—	4	Several sporadically occurring individuals	.
4			.	.			5	A few patches or clumps of a species	.
5			.	.			6	Several well spaced patches or clumps	.
6			.	.			7	Continuous uniform occurrence of well spaced individuals	.
7			.	.			8	Continuous occurrence of a species with a few gaps in the distribution	.
8			.	.			9	Continuous dense occurrence of a species	.
TOTAL SHRUB COVER		FOREST COVER		COMMENTS:					HEIGHT CLASS DISTRIBUTION CODE (m) 91 = 0 - 0.5 92 = 0.5 - 1 93 = 1 - 3 94 = 3 - 6
DOMINANT	HEIGHT CLASS	DENSITY DIST. CLASS							
SUB									
DOMINANT									
POISONOUS PLANTS				% AREA COVER	DENSITY DIST. CLASS	WEEDS		% AREA COVER	DENSITY DIST. CLASS
SPECIES		PHOTO GRID LOCATION				SPECIES		PHOTO GRID LOCATION	
1						1			
2						2			
3						3			

RANGE IMPROVEMENT - SITE POTENTIAL

WATER SOURCE
☐ creek ☐ dugout ☐ trough ☐ slough ☐ lake/pond ☐ other (specify) _____

PHOTO GRID LOCATION ☐ Required ☐ Not Required Distance (km) _____

Water Quality/Access (specify) _____

SALT SOURCE
☐ Natural ☐ Block ☐ Bag ☐ Other (specify) _____

PHOTO GRID LOCATION _____

ACCESS (CATTLE)
☐ G ☐ F ☐ P ☐ truck trail ☐ road ☐ seismic ☐ game trail ☐ valley bottom ☐ other (specify) _____

COMMENTS: CONCERNS/RECOMMENDATIONS FOR WILDLIFE USE, RECREATION OR COMMERCIAL USE

Appendix B Plant Species List at Carbondale Hill sites. List includes: common, Latin, and acronym (1999).

PLANT SPECIES LIST FOR CARBONDALE HILL - 1999

LATIN NAME	COMMON NAME	ACRONYM
GRAMINEAE		
<i>Agropyron spicatum</i> (Pursh) Scribn. & Smith	Bluebunch Wheat Grass	AGROSPI
<i>Agropyron Trachycaulum</i> var. <i>unilaterale</i> (Cassidy) Malte	Awned Wheat Grass	AGROTRA
<i>Agrostis scabra</i> Willd.	Hair Grass	AGROSCA
<i>Bromus inermis</i> Leyss	Smooth Brome	BROMINE
<i>Danthonia intermedia</i> Vasey	Timber Oat Grass	DANTINT
<i>Deschampsia caespitosa</i> (L.) Beauv.	Tufted Hair Grass	DESCCAE
<i>Festuca occidentalis</i> Hook.	Western Fescue	FESTOCC
<i>Festuca</i> sp.	Fescue sp.	FEST sp.
<i>Koeleria macrantha</i> (Ledeb.) J.A. Schultes	June Grass	KOELMAC
<i>Phleum pratense</i> L.	Timothy	PHLEPRA
<i>Poa pratensis</i> L.	Kentucky Bluegrass	POA PRA
<i>Trisetum</i> sp.	Trisetum sp.	TRIS sp.
LILIACEAE		
<i>Allium cernuum</i> Roth	Nodding Onion	ALLICER
<i>Sterptopus</i> sp.	Stalk sp.	STER
SALICACEAE		
<i>Populus tremuloides</i> Michx.	Aspen	POPUTRE
<i>Populus balsamifera</i> L.	Balsam Poplar	POPUBAL
<i>Salix</i> sp. L.	Willow sp.	SALI
CARYOPHYLLACEAE		
<i>Cerastium</i> sp.	Chickweed sp.	CERA
RANUNCULACEAE		
<i>Thalictrum occidentale</i> A. Gray	Western Meadow Rue	THALOCC
<i>Anemone multifida</i> Poir.	Cut-leaved Anemone	ANEMMUL
CRASSULACEAE		
<i>Sedum lanceolatum</i> Torr.	Common Stonecrop	SEDULAN
ROSACEAE		
<i>Fragaria virginiana</i> Duchesne	Wild Strawberry	FRAGVIR
<i>Geum macrophyllum</i> Willd.	Yellow Avens	GEUMMAC
<i>Geum triflorum</i> Poir.	Old Man's Whiskers	GEUMTRI
<i>Potentilla gracilis</i> Dougl. ex Hook	Graceful Cinquefoil	POTEGRA

<i>Rosa woodsii</i> Lindl.	Common Wild Rose	ROSAWOO
<i>Rubus idaeus</i> L.	Wild Red Raspberry	RUBUIDA
<i>Rubus</i> sp.	Raspberry sp.	RUBU
<i>Spirea betulifolia</i> Pallas	White Meadowsweet	SPIRBET
LEGUMINOSAE		
<i>Lathyrus ochroleucus</i> Hook.	Cream- colored Vetchling	LATHOCH
<i>Lupinus sericeus</i> Pursh	Perennial Lupin	LUPISER
GERANIACEAE		
<i>Geranium viscosissimum</i> Fisch. & Mey.	Sticky Purple Geranium	GERAVIS
VIOLACEAE		
<i>Viola</i> sp. L.	Violet	VIOL
ONAGRACEAE		
<i>Epilobium angustifolium</i> L.	Fireweed	EPILANG
UMBELLIFERAE		
<i>Angelica arguta</i> Nutt.	White Angelica	ANGEARG
<i>Heracleum lanatum</i> Michx.	Cow Parsnip	HERALAN
<i>Sium suave</i> Walt.	Water Parsnip	SUIMSUA
ASCLEPIADACEAE		
<i>Asclepias</i> sp.	Milkweed sp.	ASCL
BORAGINACEAE		
<i>Echium vulgare</i> L.	Viper's-bugloss	ECHIVUL
SCROPHULARIACEAE		
<i>Castilleja</i> sp.	Paint-brush sp	CAST
<i>Castilleja miniata</i> Dougl.ex Hook	Common Red Paint- brush	CASTMIN
RUBIACEAE		
<i>Galium boreale</i> L.	Northern Bedstraw	GALIBOR
CAPRIFOLIACEAE		
<i>Symphoricarpos occidentalis</i> Hook.	Buckbrush	SYMPOCC
CAMPANULACEAE		
<i>Campanula rotundifolia</i> L.	Bluebell or Harebell	CAMPROT

COMPOSITAE

Achillea millefolium L.
Agoseris glauca (Pursh) Raf.
Antennaria sp.
Antennaria neglecta Greene
Arnica cordifolia Hook.
Aster conspicuus Lindl.
Erigeron speciosus (Lindl.) DC.
Gaillardia aristata Pursh.
Senecio pseud aureus Rydb.
Senecio triangularis Hook.
Solidago sp.
Taraxacum officinale Weber

Common Yarrow
False Dandelion
Everlasting sp.
Field Pussytoes
Heart-leaved Arnica
Showy Aster
Showy Fleabane
Brown-eyed Susan
Ragwort
Brook Ragwort
Goldenrod sp.
Common Dandelion

ACHIMIL
AGOSGLA
ANTE
ANTENEG
ARNICOR
ASTECON
ERIGSPE
GAILARI
SENEPSE
SENETRI
SOLI
TARAOFF

Appendix C Locations, distances and bearings of pellet transects established to monitor ungulate use of the Carbondale Hill area.

Pellet transect locations and distances for the areas cleared of aspen in 1997.

Area	Type	Transect No.	Length (m)	Angle	Start X	Start Y	Finish X	Finish Y
C	Treatment	1	100	110	690228	5477899	690268	5477769
C	Treatment	2	100	110	690131	5477839	690267	5477742
D	Treatment	1	180	148	690509	5477439	690404	5477564
D	Treatment	2	60	104	690477	5477594	690549	5477526

Pellet transect locations and distances for the area cleared of aspen in 1998.

Area	Type*	Transect No.	Length (m)	Angle	Start X	Start Y	Finish X	Finish Y
B	Residual	1	180	268	689778	5478231	689603	5478259
B	Treatment	2	180	268	689780	5478330	689623	5478319
B	Treatment	3	180	316	689825	5478264	689758	5478271
B	Treatment	4	75	316	689882	5478414	689819	5478354
B	Residual	5	180	276	689646	5478191	689521	5478322

* - Only a small section of Area B was cleared of aspen in 1998 as indicated by "treatment".

Pellet transect locations and distances for the control area and sites cleared of aspen in 1999.

Area	Type	Transect No.	Length (m)	Angle	Start X	Start Y	Finish X	Finish Y
E	Control	1	225	296	690244	5478304	689990	5478349
E	Control	2	200	298	690225	5478199	690022	5478297
F	Treatment	1	60	170	691554	5478155	691598	5478125
F	Treatment	2	60	170	691638	5978196	694673	5478158
F	Treatment	3	60	170	691696	5478231	691664	5478177

Control area A are transects in the upper meadow and used to evaluate the use of the area by ungulates. Area F is the new sub-alpine sites cleared of aspen in August 1999.

