APPENDIXES

Appendix A. Names and addresses of people who provided personal communications.

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Dr. Norb DeByle	U.S. Forest Service Research Lab Utah State University Logan, UT 84322
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Dr. John Hart	Department of Forestry Michigan State University East Lansing, MI 48824
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Appendix A (cont.)

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*At the time of our correspondence.

Appendix B. Understory canopy-coverage in aspen stands inside and outside Yellowstone exclosures; Tables 63-67.

Table 63. Understory canopy-coverage in aspen stands inside and outside the Mammoth, Junction Butte, and Lamar exclosures in Yellowstone Park.

	Percent canopy-coverage							
	Mammoth		Junction Butte		Lamar-East		Lamar-West	
Species	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
Shrubs								
Symphoricarpos albus	24	4	--	--	16	3	18	1
Shepherdia canadensis	15	1	--	--	--	T	T	--
Potentilla fruticosa	2	1	22	8	5	T	1	T
Rosa woodsii	6	10	10	2	14	10	20	7
Berberis repens	4	--	1	--	1	--	--	--
Artemisia tridentata	T*	1	--	1	T	3	--	--
Juniper communis	8	--	--	--	5	--	--	--
Juniper scopulorum	--**	1	--	--	3	--	--	--
Ribes spp.	--	--	T	--	3	T	3	--
Prunus virginiana	--	--	--	--	1	--	T	--
Lonicera involucrata	--	--	--	--	--	T	1	--
Salix bebbiana	--	--	--	--	--	T	9	2
Amelanchier alnifolia	--	--	--	--	--	T	--	T
Salix rigida	--	--	--	--	--	--	--	1
Subtotals	59	18	33	11	48	16	52	11
Forbs								
Geranium richardsonii	5	3	--	--	--	--	3	--
Geranium viscosissimum	8	--	--	3	8	4	3	--
Fragaria virginiana	--	3	--	22	10	12	--	10
Smilacina stellata	--	--	10	--	--	--	--	--
Epilobium augustifolium	--	--	25	--	--	--	30	--
Equisetum laevigatum	--	--	--	--	23	--	--	5
Trifolium repens	--	--	--	--	--	1	--	--
Lupinus spp.	--	--	--	--	--	5	--	5
Subtotals	13	6	35	25	41	22	36	20

Table 63. (cont.)

Grasses and sedges								
Phleum pratense	10	40	--	--	15	50	8	50
Poa pratensis	12	40	10	20	2	8	8	10
Deschampsia caespitosa	--	--	5	25	--	--	--	--
Stipa occidentalis	--	--	2	10	--	--	--	--
Muhlenbergia filiformis	--	--	--	8	--	--	--	--
Carex spp.	--	--	--	--	--	--	8	5
Elymus cinereus	--	--	--	--	--	--	T	--
Subtotals	22	80	17	63	17	58	24	65

* T = trace
** To reduce confusion, dashes are used instead of zeros for absent species.

Table 64. Understory canopy-coverage in aspen stands inside and outside Range Plots 10, 16, and 25 in Yellowstone Park.

Species	Percent canopy-coverage					
	Range Plot 10		Range Plot 16		Range Plot 25	
	Inside	Outside	Inside	Outside	Inside	Outside
Shrubs						
Rosa woodsii	55	15	33	T	--	--
Symphoricarpos albus	40	--	--	--	--	--
Prunus virginiana	T*	--	--	--	--	--
Berberis repens	T	--	--	--	--	--
Ribes setosum	T	--	--	--	1	--
Artemisia tridentata	--**	--	2	--	--	--
Artemisia cana	--	--	1	--	--	--
Subtotals	95	15	36	T	1	--
Forbs						
Heracleum lanatum	T	--	--	--	--	--
Actaea rubra	3	--	--	--	--	--
Galium boreale	--	5	--	--	--	--
Achillea millefolium	--	T	--	--	--	--
Geranium viscosissimum	--	--	10	5	--	--
Fragaria virginiana	--	--	10	15	T	50
Lupinus spp.	--	--	--	3	--	--
Smilacina stellata	--	--	--	--	50	--
Others	--	--	10	7	--	--
Subtotals	3	5	30	30	50	50

Table 64. (cont.)

Grasses						
Poa pratensis	--	70	10	20	40	30
Phleum pratense	--	5	15	45	--	5
Elymus cinereus	--	T	--	--	--	--
Juncus balticus	--	--	--	--	T	10
Others	--	--	10	5	--	--
Subtotals	--	75	35	70	40	45

* T = trace
** To reduce confusion, dashes are used instead of zeros for absent species.

Table 65. Understory canopy-coverage in aspen stands inside and outside the Porcupine, Crown Butte, and Uhl Hill exclosures in the Yellowstone area.

Species	Percent canopy-coverage					
	Porcupine		Crown Butte		Uhl Hill	
	Inside	Outside	Inside	Outside	Inside	Outside
Shrubs						
Potentilla fruticosa	6	8	3	1	--	3
Amelanchier alnifolia	7	T	5	--	14	1
Juniperus communis	2	T	11	5	21	8
Juniperus scopulorum	T	T	--	--	T	T
Symphoricarpos albus	30	7	17	3	--	--
Rosa woodsii	10	2	19	3	5	1
Berberis repens	31	4	4	T	--	--
Artemisia tridentata	T*	T	1	5	40	41
Ribes spp.	1	T	12	--	--	--
Artemisia cana	--**	1	--	1	--	--
Arctostaphylos uva-ursi	--	T	2	1	--	--
Shepherdia canadensis	--	--	13	5	2	T
Prunus virginiana	--	--	10	--	6	2
Symphoricarpos orephilus	--	--	--	--	11	8
Purshia tridentata	--	--	--	--	1	T
Chrysothamnus nauseosus	--	--	--	--	--	T
Subtotals	87	22	97	24	100	64

Table 65. (cont.)

Forbs						
Smilacina stellata	5	--	2	--	1	--
Geranium viscosissimum	3	4	5	5	2	7
Fragaria virginiana	3	12	4	16	--	2
Thalictrum fendleri	2	--	--	T	--	--
Lupinus spp.	--	2	--	2	--	3
Potentilla gracilis	--	--	2	1	--	--
Heracleum lanatum	--	--	1	--	--	--
Epilobium augustifolium	--	--	8	2	--	--
Others	5	5	5	10	2	5
Subtotals	18	23	27	36	5	17
Grasses						
Poa pratensis	12	23	--	--	2	10
Phleum pratense	3	27	--	1	--	--
Stipa richardsonii	--	--	--	11	--	--
Stipa columbiana	--	--	--	3	--	--
Agropyron spicatum	--	--	--	2	--	--
Festuca idahoensis	--	--	--	11	5	5
Others	2	5	2	8	3	5
Subtotals	17	55	2	36	10	20

* T = trace
** To reduce confusion, dashes are used instead of zeros for absent species.

Table 66. Understory canopy-coverage in aspen stands inside and outside the East Elk Refuge, Upper Slide Lake, and Soda Lake exclosures in the Yellowstone area.

Species	Percent canopy-coverage					
	East Elk Refuge		Upper Slide Lake		Soda Lake	
	Inside	Outside	Inside	Outside	Inside	Outside
Shrubs						
Prunus virginiana	14	T	4	--	2	T
Symphoricarpos orephilus	38	9	3	2	23	17
Rosa woodsii	40	12	19	8	19	6
Amelanchier alnifolia	39	2	--	--	2	2
Artemisia tripartita	T*	--	--	--	--	--
Chrysothamnus nauseosus	T	--	T	--	T	T
Ribes spp.	6	--	5	--	--	--
Lonicera involucrata	T	--	--	--	--	--
Shepherdia canadensis	--**	T	25	--	--	--
Potentilla fruticosa	--	--	6	--	--	--
Juniperus communis	--	--	11	--	--	T
Artemisia tridentata	--	--	5	2	14	4
Arctostaphylos uva-ursi	--	--	2	--	T	--
Chrysothamnus viscidiflorus	--	--	T	--	--	--
Berberis repens	--	--	--	--	16	6
Juniper scopulorum	--	--	--	--	--	T
Subtotals	137	23	80	12	76	35

Table 66. (cont.)

Forbs						
Epilobium augustifolium	10	20	--	--	--	--
Smilacina stellata	5	--	T	--	--	--
Lupinus spp.	--	5	--	8	2	9
Geranium viscosissimum	--	5	4	25	7	11
Fragaria virginiana	--	--	4	10	--	--
Potentilla gracilis	--	--	--	5	--	1
Lithospermum ruderale	--	--	--	2	--	--
Thalictrum fendleri	--	--	--	2	--	--
Linum perenne	--	--	--	3	--	--
Others	T	5	5	10	5	9
Subtotals	15	35	13	65	14	30
Grasses						
Poa pratensis	5	--	--	2	5	22
Calamagrostis rubescens	--	40	--	--	--	--
Poa secunda	--	--	--	8	--	--
Bromus anomalus	--	--	2	5	--	--
Festuca idahoensis	--	--	--	5	5	--
Agropyron spicatum	--	--	--	--	2	--
Pheum pratense	--	--	--	--	--	8
Others	T	2	3	8	5	5
Subtotals	5	42	5	28	17	35

* T = trace
** To reduce confusion, dashes are used instead of zeros for absent species.

Table 67. Understory canopy-coverage in aspen stands inside and outside the Goosewing exclosure in the Yellowstone area.

Species	Percent canopy-coverage							
	Northwest corner		South side		Northeast		Total	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
Shrubs								
Potentilla fruticosa	15	31	19	T	4	5		
Rosa woodsii	19	16	20	22	14	20		
Arctostaphylos uva-ursi	8	5	--	--	--	--		
Symphoricarpos orephilus	6	1	2	8	--	6		
Shepherdia canadensis	12	2	7	8	12	24		
Artemisia cana	T*	2	--	--	--	--		
Artemisia tridentata	1	2	--	--	--	2		
Amelanchier alnifolia	8	T	1	7	--	--		
Prunus virginiana	1	--	--	1	--	T		
Ribes spp.	2	--	2	--	4	2		
Lonicera involucrata	1	--	--	2	--	4		
Salix spp.	--**	1	--	--	--	--		
Subtotals	72	60	51	48	34	63	52	57
Forbs								
Geranium viscosissimum	5	8	12	18	15	12		
Lupinus spp.	12	5	8	12	--	5		
Fragaria virginiana	5	8	5	2	--	2		
Epilobium augustifolium	5	5	5	2	2	T		

Table 67. (cont.)

Thalictrum fendleri	--	--	10	10	40	5		
Smilacina stellata	--	--	2	--	5	--		
Potentilla gracilis	--	--	--	--	--	2		
Others	5	5	8	5	2	5		
Subtotals	32	31	50	49	64	31	49	37
Grasses								
Poa pratensis	2	7	--	--	--	--		
Bromus anomalus	--	--	--	--	--	2		
Others	5	5	1	2	1	4		
Subtotals	7	12	1	2	1	6	3	7

* T = trace
** To reduce confusion, dashes are used instead of zeros for absent species.

Appendix C. Willow Communities on the Northern Range, from Chadde et al. (1988).

Willow communities on the northern range occur in a wide range of environments, elevations, and topographic settings. Brichta (1987) identified four general settings supporting willow communities: (1) Adjacent to stream and river channels, in overflow channels, and on floodplains; (2) in depressions and around kettle lakes formed by blocks of glacial ice; (3) adjacent to springs and seeps on foothill slopes; and (4) in abandoned beaver channels and ponds.

Eight unique willow associations and community types were identified on the northern range (Chadde et al. 1988), ranging from low-willow carrs (shrub-dominated wetlands on wet, organic soils) to tall-willow types on seasonally dry mineral soils:

1. Salix candida/Carex rostrata Association. These are infrequent at higher elevations of the northern range. They are restricted to anchored organic mats along pond and lake margins. In addition to Salix candida and Carex rostrata, Carex aquatilis and Calamagrostis canadensis may also be present. The low stature of Salix candida (maximum height of about 1m) and higher-elevation location precludes much ungulate winter use of this species. However, utilization during snow-free periods and the inability of this species to produce vigorous basal sprouts following repeated browsing may result in a conversion to dominance by Carex rostrata.

2. Salix wolfii/Carex aquatilis Association. These common, low-willow communities are found at mid-to-high elevations where they occupy extensive areas of valley bottoms and basins. Soils are typically wet with organic surface horizons. Major species include Salix wolfii, Salix planifolia, Potentilla fruticosa, Carex aquatilis, Carex rostrata, and Deschampsia cespitosa. Ungulate use of these willows is typically heavy, with willows maintained at heights of 60cm or less. A conversion to sedge-dominated communities is likely as willow clumps die and are

not replaced.

3. Salix wolfii/Deschampsia cespitosa Association. This low-willow association is a minor type of streamside terraces and seeps. It typically occupies drier environments than the Salix wolfii/Carex aquatilis association. Major shrubs include Salix wolfii, Salix planifolia, and Potentilla fruticosa. Important herbaceous plants include Deschampsia cespitosa, Juncus balticus, and Poa pratensis. Ungulates frequently graze these communities and browse on the short-statured willows.

4. Salix lutea/Carex rostrata Association. These minor tall-willow communities are found on slopes adjacent to springs and seeps. Soils are wet and range from organic to mineral. Salix lutea and Salix pseudomonticola are often codominant. Other tall willows, such as Salix bebbiana and S. geyeriana are common. Undergrowths are dominated by Carex rostrata, C. aquatilis, and Poa palustris. These communities could potentially form dense thickets, 3-4m tall. Current levels of ungulate browsing typically limit heights to 1m or less. Canopy-coverages are also greatly reduced by repeated browsing.

5. Salix geyeriana/Carex rostrata Association. These widely distributed communities are found on fine-textured mineral soils of alluvial terraces, broad valley bottoms, and adjacent to former beaver ponds. Common tall-willow species include Salix geyeriana, S. bebbiana, S. drummondiana, and S. planifolia. Herbaceous species include Carex rostrata, Calamagrositis canadensis, and Poa palustris. Elk and moose use is high and results in willows of low stature and reduced canopy cover.

6. Salix geyeriana/Deschampsia cespitosa Association. These common tall-willow communities occur on loamy soils adjacent to seeps and streams. Salix geyeriana, S. boothii, and S. bebbiana are the dominant willows. Deschampsia cespitosa, Juncus balticus, and Poa pratensis are common herbaceous species. These communities are

potentially highly productive of both browse and forage. However, ungulate browsing maintains willows at heights of 1m or less versus potential heights of 3-4m.

7. Salix bebbiana/Agrostis stolonifera community type. This tall-willow community type occupies small areas adjacent to seeps and streams. Soils are mineral but may have surface organic matter accumulations. Salix bebbiana, Rosa woodsii, and Betula occidentalis are common. The introduced species Agrostis stolonifera, Poa palustris, Poa pratensis, and Phleum pratense typically dominate undergrowths and probably are the result of repeated grazing. Browsing has produced open, short-statured stands, in contrast to potential growth of 3-4m.

8. Salix exigua/Agrostis stolonifera community type. This tall-willow community type is typically restricted to low-elevation streambanks and cobble bars, often below high water levels. Rosa woodsii is common. Other tall-growing willows may be present, indicating successional trends toward other willow types. Heavy browsing, however, often reduces or eliminates stands of this community type, leading to replacement by herbaceous species such as Agrostis stolonifera and Poa palustris.

In general, all willow stands are impacted by ungulate browsing, with higher-elevation stands being less affected than lower-elevation stands because of greater snow depths. Repeated browsing has resulted in sharp reductions in willow heights and canopy-coverage when contrasted to potential community structure.

Appendix D. State tabulations of ungulate remains recovered from archaeological sites; Tables 68-81.

Table 68. Ungulate remains recovered from archaeological sites in Wyoming. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Eden-Farson 48SW304	*	*	*	0	0	0	212	0	0
Oyster Ridge 48UT35	1,736	72	4%	0	0	0	3	0	0
Cow Hollow Creek 48LN127 (2)	321	46	14%	0	1	*	0	0	0
Bottleneck Cave 10LH124 (3)	*	*	*	0	*	*	*	*	0
48SW1242	1,065	*	*	0	*	*	0	0	0
48UT390	2,100	100	5%	0	1	0	3	0	0
Deadman Wash (4) 48SW1455	*	*	*	0	12	2	8	2	0
Pine Springs (5) 48SW101	2,854	*	*	0	*	*	*	*	0
48CA139 (6)	3,529	*	*	0	4	0	10	0	0
Sheehan 48CR4114	445	*	*	1	3	3	2	1	0
Maxon Ranch (7) 48SW2590	4,560	*	*	0	1	4	3	0	0
Medicine Lodge 48BH499	*	*	*	1	14	13	1	11	0
Point of Rocks 48SW5019	2,932	*	*	0	*	0	*	0	0

Table 68. (cont.)

Joe Miller 48AB18	429	*	*	2	0	0	0	0	0
48SW1455	152	*	*	0	0	0	1	2	0
Taliaferro 48LN1468	1,265	*	*	0	3	3	8	0	0
Austin Wash 48UT390	16,511	2,027	12%	0	2	0	15	0	0
48UT199	827	129	16%	0	1	0	5	0	0
Blacks Fork 48UT370 48UT377 48UT379	763	*	*	0	0	0	2	0	0
Totals	>39,489	>2,374	*	4	42	25	273	16	0
Percent of Total	-	-	-	1%	12%	7%	76%	4%	0%
Rank	-	-	-	5	2	3	1	4	6

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 29 bones were listed as either deer or antelope.
3. An additional 63 bones were listed as either deer or antelope.
4. An additional 7 individuals were listed as either deer or antelope.
5. An additional 1,936 bones were listed as probable bighorn sheep.
6. An additional 428 bones were listed as either deer of antelope.
7. An additional 104 bones were listed as either deer or antelope (MNI=4) and 5 bones were listed as large artiodactyl (MNI=3).

Table 69. Ungulate remains recovered from archaeological sites in Wyoming. Part 2: Number of identified specimens.

Site	Date	Number of identified specimens (NISP)						Reference
		Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	
Eden-Farson 48SW304	200BP	0	0	0	*	0	0	Frison 1971a
Oyster Ridge 48UT35	1300BP	0	0	0	*	0	0	Zier 1982
Cow Hollow Creek 48LN127 (2)	3400-1300BP	0	1	30	*	0	0	Schock et al. 1982
Bottleneck Cave 10LH124 (3)	9100-1400BP	0	3	*	*	47	0	Husted 1969
48SW1242	2170-1550BP	0	8	9	6	0	0	Hoefer 1986
48UT390	1100BP	0	1	0	100	0	0	Reiss and Walker 1982
Deadman Wash 48SW1455 (4)	6000-500BP	0	*	*	*	*	0	Mackey et al. 1982
Pine Springs 48SW101 (5)	7800-1700BP	0	188	12	9	490	0	Sharrock 1966
48CA139 (6)	2900-1100BP	0	15	0	257	0	0	McKibbin et al. 1988
Sheehan 48CR4114	1500-1200BP	1	5	5	2	2	0	Bower et al. 1986
Maxon Ranch 48SW2590 (7)	6400-1200BP	0	1	57	16	0	0	Harrell and McKern 1986
Medicine Lodge 48BH499	10,000-500BP	1	25	62	1	64	0	Walker 1975a

Table 69. (cont.)

Point of Rocks 48SW5019	6200-1100BP	0	23	0	4	0	0	Creasman et al. 1983
Joe Miller 48AB18	1600-400BP	17	0	0	0	0	0	Creasman et al. 1982
48SW1455	2000-1000BP	0	0	0	2	25	0	Creasman et al. 1982
Taliaferro 48LN1468	5290-960BP	0	7	3	32	0	0	Smith and Creasman 1988
Austin Wash 48UT390	3000-1100BP	0	99	0	1,880	0	0	Schroedl 1985
48UT199	4800-1100BP	0	1	0	83	0	0	Schroedl 1985
Blacks Fork 48UT370 48UT377 48UT379	4800-1000BP	0	0	0	26	0	0	Schroedl 1985
Totals	10000-200BP	19	377	178	2,418	628	0	(360/3,620)[8]
Percent of Total	-	1%	10%	5%	67%	17%	0%	
Rank	-	5	3	4	1	2	6	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 29 bones were listed as either deer or antelope.
3. An additional 63 bones were listed as either deer or antelope.
4. An additional 7 individuals were listed as either deer or antelope.
5. An additional 1,936 bones were listed as probable bighorn sheep.
6. An additional 428 bones were listed as either deer of antelope.
7. An additional 104 bones were listed as either deer or antelope (MNI=4) and 5 bones were listed as large artiodactyl (MNI=3).
8. Total MNI/total NISP.

Table 70. Ungulate remains recovered from archaeological sites in Montana. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Sorenson Site 24CB202 (2)	*	*	*	0	*	*	0	0	0
Mangus Site 24CB221	*	*	*	0	*	*	0	0	0
LAURD Project 24LN10 24LN528 24LN1020 24LN1029 24LN1124 24LN1125	*	*	*	4	0	25	0	3	0
Libby Reservoir (3)	4,360	>200	>5%	*	0	*	0	0	0
Libby Reservoir 24LN1054	861	5	1%	0	0	*	0	1	0
Totals	>5,221	*	*	4	0	25	0	3	0
Percent of Total	-	-	-	13%	0%	78%	0%	9%	0%
Rank	-	-	-	2	4	1	4	3	4

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. In addition hair or hides were recovered from bison, elk, and mule deer.
3. Includes material from 83 different archaeological sites.

Table 71. Ungulate remains recovered from archaeological sites in Montana. Part 2: Number of identified specimens.

Site	Date	Number of identified specimens (NISP) Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Sorenson Site 24CB202 (2)	6000-1200BP	0	6	35	0	0	0	Husted 1969
Mangus Site 24CB221	6000-1200BP	0	12	84	0	0	0	Husted 1969
LAURD Project 24LN10 24LN528 24LN1020 24LN1029 24LN1124 24LN1125	6000-200BP	12	0	1,380	0	5	0	Henry 1982, Roll 1982, Roll and Smith 1982
Libby Reservoir (3)	6000-200BP	12	0	49	0	0	0	Thoms 1984
Libby Reservoir 24LN1054	7000-2000BP	0	0	2	0	1	0	Thoms and Burtchard 1987
Totals	7000-200BP	24	18	1,550	0	6	0	(32/1,598)[4]
Percent of Total	-	2%	1%	97%	0%	0.4%	0%	
Rank	-	2	3	1	5	4	5	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. In addition hair or hides were recovered from bison, elk, and mule deer.
3. Includes material from 83 different archaeological sites.
4. Total MNI/total NISP.

Table 72. Ungulate remains recovered from archaeological sites in Idaho. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Numbers of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Birch Creek 10CL3 and 10CL10	*	*	*	3	170	45	27	89	0
Weston Canyon	*	*	*	16	9	8	0	300	0
Dry Creek Rockshelter 10AA68	*	*	*	0	0	26	2	3	0
Corn Creek 10LH124	25,173	462	2%	0	1	8	0	24	0
Shoup Rockshelters 10LH23 (2) 10LH63	*	*	*	0	0	*	0	*	0
Lydle Gulch 10AA72 (3)	13,821	*	4%	*	0	*	*	*	0
Kooskia Bridge 10IH1395 (4)	5,442	150	3%	*	0	*	0	*	0
Baker Caves 10BN153 10BN154	*	*	*	0	17	0	0	0	0
Crutchfield 10GG191	*	*	*	0	*	*	*	*	0
Bliss 10GG1	60,000	610	1%	*	*	*	*	0	0
Wahmuza 10BK26	21,799	*	2%	0	2	18	6	0	1
Wilson Butte (5)	*	*	*	0	*	0	8	0	0

Table 72. (cont.)

Totals	>126,235	>1,222	*	19	199	10	35	413	1
Percent of Total	-	-	-	2%	26%	14%	5%	53%	0.1%
Rank	-	-	-	5	2	3	4	1	6

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 105 bones were listed as artiodactyi.
3. An additional 315 bones were listed as undifferentiated medium artiodactyles, 7 as undifferentiated cervidae, and 13 as undifferentiated large ungulates.
4. An additional 169 bones were listed as deer/bighorn sheep/antelope and 6 as elk/deer.
5. An additional 3 bones were listed as deer/antelope.

Table 73. Ungulate remains recovered from archaeological sites in Idaho. Part 2: number of identified specimens.

Site	Date	Number of identified specimens (NISP) Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Birch Creek 10CL3 10CL10	8000-100BP	4	1,250	81	46	332	0	Swanson 1972
Weston Canyon	8000-2000BP	*	*	*	0	*	0	Miller 1972
Dry Creek Rockshelter 10AA68	4150-1300BP	0	0	78	2	12	0	Webster 1978
Corn Creek 10LH124	5000-500BP	0	1	17	0	306	0	Holmer and Ross 1985
Shoup Rockshelters 10LH23 (2) 10LH63	8000-500BP	0	0	7	0	221	0	Swanson and Sneed 1966; R. Holmer, pers. commun. 1988
Lydle Gulch (3) 10AA72	4500-100BP	18	0	149	4	1	0	Sappington 1981
Kooskia Bridge (4) 10IH1395	2500-250BP	2	0	114	0	1	0	Sappington and Carley 1987
Baker Caves 10BN153 10BN154	1300-800BP	0	588	0	0	0	0	Plew et al. 1987
Crutchfield 10GG191	7400-600BP	0	23	39	3	6	0	Murphey and Crutchfield 1985
Bliss 10GG1	1000-200BP	25	3	175	28	0	0	Plew 1981
Wahmuza 10BK26	2000-100BP	0	22	181	54	0	1	Holmer 1986

Table 73. (cont.)

Wilson Butte (5)	10000-300BP	0	85	0	2	0	0	Gruhn 1961
Totals	10000-100BP	49	1,972	841	139	879	1	(772/3,881)[6]
Percent of Total	-	1%	51%	22%	4%	23%	0.03%	
Rank	-	5	1	3	4	2	6	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 105 bones were listed as artiodactyi.
3. An additional 315 bones were listed as undifferentiated medium artiodactyles, 7 as undifferentiated cervidae, and 13 as undifferentiated large ungulates.
4. An additional 169 bones were listed as deer/bighorn sheep/antelope and 6 as elk/deer.
5. An additional 3 bones were listed as deer/antelope.
6. Total MNI/total NISP.

Table 74. Ungulate remains recovered from archaeological sites in Utah. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Evans Mound	2,832	*	5%	0	0	13	6	10	0
Sudden Shelter 42SV6	*	*	*	0	2	106	6	24	0
Cowboy Cave 42 WN420	*	*	*	1	1	5	0	10	0
Spotten Cave 42UT104	*	3,001	*	0	0	10	2	0	0
Woodard Mound 42UT102	*	140	*	1	0	2	0	0	0
Hinckley Mounds									
42UT110	*	692	*	0	0	6	0	0	0
42UT111	*	211	*	0	0	1	0	0	0
Seamonds Mound 42UT271	*	1,428	*	0	0	7	3	0	0
Sandwich Shelter	*	2,652	*	0	0	*	0	*	0
Backhoe Village 42SV662	1,186	241	20%	0	0	1	0	2	0
Black Rock Cave	2,184	509	23%	0	0	5	3	7	0
Bonanza Dune 42KA1076	*	*	*	0	0	*	0	*	0
Pharo Village 42MD180	4,744	*	*	0	*	*	0	*	0
Hogup Cave (2)	*	*	*	0	22	34	104	15	0

Table 74. (cont.)

Aspen Shelter 42SV1325	962	132	14%	0	0	*	0	0	0
Glen Canyon 9 sites (3)	*	*	*	0	0	*	0	*	0
Glen Canyon 8 sites	*	*	*	0	0	*	0	*	0
Harris Wash 5 sites (4)	*	*	*	0	0	*	0	*	0
American Fork Cave 42UT135 (5)	*	*	*	0	0	1	0	55	0
Nephi Mounds 42JB2	4,524	*	*	0	0	*	0	*	0
Median Village 42IN124	*	4,994	*	0	1	37	4	24	0
Caldwell Village 42UN95 (6)	1,300	*	*	0	0	*	*	*	0
Swallow Shelter 42BO268	11,799	3,243	27%	0	10	5	1	41	0
Kimber Shelter 42BO245	*	*	*	0	0	1	2	0	0
Remnant Cave 42BO365	*	*	*	0	0	10	6	10	0
Injun Creek	4,083	2,803	69%	*	0	*	*	*	0
Snake Rock Village	*	*	*	1	1	4	0	5	0
Subtotals	>33,614	>20,046	*	3	37	247	138	203	0
Percent of Subtotal	-	-	-	0.5%	6%	39%	22%	32%	0%

Table 74. (cont.)

Rank	-	-	-	5	4	1	3	2	6
Bear River No. 1	5,544	2,494	45%	*	*	*	0	*	0
Bear River No. 2	*	*	*	*	*	*	*	*	0
Bear River No. 3	*	*	*	0	*	*	*	0	0
Woodruff Bison Kill	*	*	*	0	85	0	0	0	0
Subtotals	>5,544	>2,494	*	*	85	*	*	*	0
Percent of Subtotal	-	-	-	-	-	-	-	-	-
Rank	-	-	-	-	-	-	-	-	-

* Data were not presented in site report.
1. Includes both mule and white-tailed deer but since the latter are not presently found in Utah, they are most probably all mule deer.
2. 3,440 individual animals were identified.
3. An additional 354 bones were listed as bighorn/deer.
4. An additional 369 bones were listed as bighorn/deer.
5. An additional 162 bighorn sheep horn cores were received.
6. Under bone artifacts or worked bone an elk scapula scraper and elk scapula hoe were listed.

Table 75. Ungulate remains recovered from archaeological sites in Utah. Part 2: Number of identified specimens.

Site	Date	Number of identified specimens (NISP) Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Evans Mound	1000-700BP	0	0	*	*	*	0	Dodd 1982
Sudden Shelter 42SV6	8000-3000BP	0	*	*	*	*	0	Jennings et al. 1980
Cowboy Cave 42 WN420	8700-1500BP	*	*	*	0	*	0	Jennings 1980
Spotten Cave 42UT104	6000-1000BP	0	0	1,142	150	0	0	Cook 1980
Woodard Mound 42UT102	Fremont	4	0	25	0	0	0	Cook 1980
Hinckley Mounds								
42UT110	Fremont	0	0	107	0	0	0	Cook 1980
42UT111	Fremont	0	0	35	1	0	0	
Seamonds Mound 42UT271	Fremont	0	0	258	23	0	0	Cook 1980
Sandwich Shelter	7000-1000BP	0	0	41	0	57	0	Marwitt et al. 1971
Backhoe Village 42SV662	1400-840BP	0	0	10	0	14	0	Madsen and Lindsay 1977
Black Rock Cave	6000-1000BP	0	0	33	4	54	0	Madsen 1983
Bonanza Dune 42KA1076	1000-700BP	1	0	630	0	61	0	Aikens 1965
Pharo Village 42MD180	1500-700BP	0	18	305	0	86	0	Marwitt 1968
Hogup Cave (2)	8500-100BP	0	*	*	*	*	0	Aikens 1970

Table 75. (cont.)

Aspen Shelter 42SV1325	4300-700BP	0	0	120	0	0	0	James and Pecotte 1983
Glen Canyon (3) 9 sites	*	0	0	12	0	104	0	Sharrock et al. 1963
Glen Canyon 8 sites	*	0	0	15	0	106	0	Sharrock 1964
Harris Wash (4) 5 sites	*	0	0	19	0	72	0	Fowler 1963
American Fork Cave 42UT135 (5)	*	0	0	*	0	*	0	Hall 1983
Nephi Mounds 42JB2	1100-900BP	0	0	645	0	93	0	Sharrock and Marwill 1967
Median Village 42IN124	1000-900BP	0	2	2,341	18	392	0	Marwitt 1970
Caldwell Village 42UN95 (6)	850-700BP	0	0	25	125	1	0	Ambler 1966
Swallow Shelter 42BO268	5400-1000BP	0	*	*	*	*	0	Dalley 1976
Kimber Shelter 42BO245	1500-600BP	0	0	1	24	0	0	Dalley 1976
Remnant Cave 42BO365	5000-400BP	0	0	*	*	*	0	Dalley 1976
Injun Creek	600-300BP	1	0	1,713	1	37	0	Aikens 1966
Snake Rock Village	900-600BP	1	1	76	0	584	0	Aikens 1967
Subtotals	8700-300BP	7	21	5,764	346	1,661	0	(628/7,799)[7]
Percent of Subtotal	-	0.1%	0.3%	74%	4%	21%	0%	

Table 75. (cont.)

Rank	-	5	4	1	3	2	6	
Bear River No. 1	900BP	173	1,541	87	0	5	0	Aikens 1966
Bear River No. 2	1000BP	9	786	12	3	7	0	Aikens 1967
Bear River No. 3	1400BP	0	670	26	10	0	0	Shields and Dalley 1978
Woodruff Bison Kill	1300BP	0	*	0	0	0	0	Shields 1978
Subtotals	1400-900BP	182	2,997	125	13	12	0	(85/3,329)[7]
Percent of Subtotal	-	5%	90%	4%	0.4%	0.4%	0%	
Rank	-	2	1	3	4	5	6	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer but since the latter are not presently found in Utah, they are most probably all mule deer.
2. 3,440 individual animals were identified.
3. An additional 354 bones were listed as bighorn/deer.
4. An additional 369 bones were listed as bighorn/deer.
5. An additional 162 bighorn sheep horn cores were received.
6. Under bone artifacts or worked bone an elk scapula scarper and elk scapula hoe were listed.
7. Subtotal MNI/subtotal NISP.

Table 76. Ungulate remains recovered from archaeological sites in Nevada. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to Species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer1	Antelope	Bighorn	Moose
Danger Cave	*	3,513	*	0	*	*	*	*	0
Lost Supper Cave	*	8,975	*	*	0	*	*	*	0
Hanging Rock Shelter	*	6,422	*	*	*	*	*	*	0
Glendale Site 26WA2065	5,370	*	*	0	0	1	1	1	0
Wagon Jack Shelter	*	*	*	0	0	*	*	*	0
James Creek Shelter	*	3,773	*	0	*	*	*	*	0
Gatecliff Shelter 26NY301	*	13,000	*	*	*	*	*	*	0
Hidden Cave 26CH16	*	7,835	*	0	*	*	*	0	0
South Fork Shelter	2,298	331	14%	*	0	*	*	*	0
Deer Creek Cave (2)	8,123	371	5%	0	*	0	*	*	0
O'Malley Shelter	12,350	2,249	18%	0	*	*	0	*	0
Conaway Shelter 26LN126	1,901	219	12%	0	0	*	0	*	0
Scott Site 26LN407	217	13	6%	0	0	*	0	*	0
Slient Snake Springs 26HU201	*	*	*	0	0	*	*	*	0

Table 76. (cont.)

Smoky Creek Cave 26HU46	*	*	*	0	0	*	*	*	0
Little Smoky Shelter 26WA1501	*	*	*	0	0	0	0	*	0
26WA1502	*	*	*	0	0	*	*	*	0
Amy's Rockshelter 26WP230	9,555	*	*	0	0	1	0	49	0
Civa Shelter II	43,482	7,675	18%	0	1	3	0	8	0
Slivovitz Shelter 26NY1272	*	*	*	0	0	1	0	10	0
Avocado Shelter 26NY1263	*	*	*	0	0	2	0	5	0
Totals	>83,296	>54,376	*	*	1	8	1	73	0
Percent of Total	-	-	-	*	1%	10%	1%	88%	0
Rank	-	-	-	5	4	2	3	1	6

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 2 bones were listed as deer/elk.

Table 77. Ungulate remains recovered from archaeological sites in Nevada. Part 2: Number of identified specimens.

		Number of identified specimens (NISP)						
Site	Date	Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Danger Cave	9500-1900BP	0	11	31	31	373	0	Grayson 1988
Lost Supper Cave	9000-1000BP	9	0	18	22	2194	0	Grayson 1988
Hanging Rock Shelter	8000-1000BP	34	2	3	8	48	0	Grayson 1988
Glendale Site 26WA2065	*	0	0	1	2	3	0	Dansie and Ringkob 1979
Wagon Jack Shelter	1500BP	0	0	14	11	130	0	Heizer and Baumhoff 1961
James Creek Shelter	*	0	25	1	6	45	0	Grayson 1989a
Gatecliff Shelter 26NY301	5400-600BP	1	4	17	25	890	0	Thomas 1983
Hidden Cave 26CH16	5400-800BP	0	1	2	11	0	0	Thomas 1985
South Fork Shelter	4000-500BP	10	0	38	1	81	0	Heizer et al. 1968
Deer Creek Cave (2)	9000-1500BP	0	3	0	1	157	0	Shutler and Shutler 1963
O'Malley Shelter	7200-100BP	0	2	123	0	98	0	Fowler et al. 1973
Conaway Shelter 26LN126	1700-100BP	0	0	84	0	70	0	Fowler et al. 1973
Scott Site 26LN407	1000BP	0	0	5	0	4	0	Fowler et al. 1973
Slient Snake Springs 26HU201	5200-4000BP	0	0	4	4	48	0	Layton and Thomas 1979
Smoky Creek Cave 26HU46	*	0	0	2	12	36	0	Thomas 1970

Table 77. (cont.)

Little Smoky Shelter 26WA1501	*	0	0	0	0	20	0	Thomas 1970
26WA1502	*	0	0	1	1	7	0	Thomas 1970
Amy's Rockshelter 26WP230	5000-100BP	0	0	*	0	*	0	Tuohy and Rendall 1979
Civa Shelter II	1200-100BP	0	1	12	0	422	0	Busby 1979
Slivovitz Shelter 26NY1272	1200-100BP	0	0	1	0	464	0	Busby 1979
Avocado Shelter 26NY1263	800-100BP	0	0	2	0	18	0	Busby 1979
Totals	9500-100BP	54	49	359	135	5,108	0	(83/5,705)[3]
Percent of Total	-	1%	1%	6%	2%	90%	0	
Rank	-	4	5	2	3	1	6	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 2 bones were listed as deer/elk.
3. Total MNI/total NISP.

Table 78. Ungulate remains recovered from archaeological sites in Oregon. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Robinette Cave 35BA3	*	*	*	*	*	*	*	0	0
Ray Site 35BA23	*	*	*	0	*	*	0	0	0
Robinette Village 35BA5 (2)	*	*	*	*	0	*	0	0	0
Hells Canyon Creek Rockshelter	*	288	*	0	0	*	0	*	0
Hells Canyon Creek Village 35WA78	*	*	*	0	0	*	0	*	0
Dirty Shame Rockshelter (3)	*	3,461	*	0	4	9	13	10	0
Lava Island Rockshelter 35DS86	874	32	4%	0	0	*	0	0	0
Cascidia Cave (4)	*	262	*	1	0	11	0	0	0
Elk Creek Lake									
35JA27B	446	10	2%	0	0	*	0	0	0
35JA27A	1,870	38	2%	*	0	*	0	0	0
35JA59	5,347	166	3%	*	0	*	0	0	0
35JA100	18,408	436	2%	*	0	*	0	0	0
Rigdon's Horse Pasture Cave 35LA39 (5)	12,409	273	2%	0	0	14	0	0	0

Table 78. (cont.)

Salt Cave Project									
35KL21	*	1,156	*	4	0	31	4	7	0
Border Village	*	659	*	3	0	28	5	3	0
35K18	*	376	*	1	0	8	4	2	0
Fort Rock Cave	*	160	*	*	*	0	*	*	0
Connley Caves 35LK50	*	2,114	*	*	*	*	*	*	0
35JA42 (6)	20,023	78	0.4%	*	0	*	0	0	0
Wildcat Canyon 35GM9	*	*	*	*	*	*	0	*	0
Morris Site 35GM91	9,538	505	5%	*	*	*	*	*	0
Downey Gulch									
35WA616	785	84	11%	*	0	*	*	*	0
35WA615	346	25	7%	0	0	*	*	*	0
Rogue River Basin 6 sites	*	*	*	*	0	*	0	0	0
Subtotals	>70,046	>10,123	-	9	4	101	26	22	0
Percent of Subtotal	-	-	-	6%	2%	62%	16%	14%	0%
Rank	-	-	-	4	5	1	2	3	6
Coastal sites									
35DO83	*	*	*	*	0	*	0	0	0
35LNC14	*	*	*	*	0	*	0	0	0
35LNC60	*	*	*	*	0	*	0	0	0
35CS43C	*	134	*	*	0	*	0	0	0

Table 78. (cont.)

Subtotals	*	> 134	*	*	0	*	0	0	0
Percent of Subtotal	-	-	-	-	-	-	-	-	-
Rank	-	-	-	-	-	-	-	-	-

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 8 bones were listed as deer/antelope.
3. An additional 146 bones were listed as bison or domestic cow and antelope hairs were found in human coprolites.
4. Listed as 11-16 individual deer in site report.
5. An additional 25 individuals were listed as deer? and an additional 124 bones were listed as deer?.
6. An additional 50 bones were listed as probable deer and 5 more as probable elk.

Table 79. Ungulate remains recovered from archaeological sites in Oregon. Part 2: Number of identified species.

		Number of identified specimens (NISP)						
Site	Date	Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Robinette Cave 35BA3	1400-100BP	1	3	110	9	0	0	Caldwell and Mallory 1967
Ray Site 35BA23	1400-100BP	0	1	8	0	0	0	Caldwell and Mallory 1967
Robinette Village 35BA5 (2)	1400-100BP	1	0	6	0	0	0	Caldwell and Mallory 1967
Hells Canyon Creek Rockshelter	*	0	0	18	0	70	0	Pavesic 1971
Hells Canyon Creek Village 35WA78	*	0	0	8	0	401	0	Pavesic 1986
Dirty Shame Rockshelter (3)	9500-400BP	0	10	18	25	39	0	Grayson 1977, Aikens et al. 1977, Hall 1977
Lava Island Rockshelter 35DS86	10000-150BP	0	0	12	0	0	0	Minor and Toepel 1984
Cascidia Cave (4)	*	1	0	256	0	0	0	Newman 1966
Elk Creek Lake								
35JA27B	5000-700BP	0	0	9	0	0	0	Pettigrew and Lebow 1987
35JA27A	4000-400BP	1	0	31	0	0	0	
35JA59	2300-900BP	3	0	146	0	0	0	
35JA100	4000-400BP	3	0	419	0	0	0	
Rigdon's Horse Pasture Cave (5) 35LA39	2450-130BP	0	0	122	0	0	0	Baxter et al. 1983

Table 79. (cont.)

Salt Cave Project	7000-200BP							
35KL21		11	0	393	10	19	0	Mack 1983
Border Village		7	0	226	7	6	0	
35K18		13	0	189	8	204	0	
Fort Rock Cave	11000-3000BP	1	5	0	2	6	0	Grayson 1979
Connley Caves 35LK50	11000-3000BP	25	40	14	8	1	0	Grayson 1979
35JA42 (6)	*	5	0	58	0	0	0	Schmitt 1986
Wildcat Canyon 35GM9	8000-500BP	32	121	254	0	38	0	Dumond and Minor 1983
Morris Site 35GM91	5000-100BP	7	7	118	2	26	0	Schalk 1987
Downey Gulch	4000-100BP							
35WA616		1	0	3	5	11	0	Reid 1988
35WA615		0	0	1	6	15	0	
Rogue River Basin 6 sites	10000-150BP	20	0	498	0	0	0	Pettigrew and Lebow 1987
Subtotals	11000-100BP	132	187	2,918	82	635	0	(162/3,954)[7]
Percent of Subtotal	-	3%	5%	74%	2%	16%	0%	
Rank	-	4	3	1	5	2	6	
Coastal sites								
35DO83	3000-50BP	363	0	381	0	0	0	Lyman 1989
35LNC14	400-100BP	248	0	257	0	0	0	Lyman 1989
35LNC60	3000-200BP	130	0	81	0	0	0	Lyman 1989

Table 79. (cont.)

35CS43C	*	68	0	42	0	0	0	Lindsay and Keith 1986, Linton-Vogel and Hall 1986
Subtotals	3000-50BP	809	0	761	0	0	0	(*/1,570)[7]
Percent of Subtotal	-	52%	0%	48%	0%	0%	0%	
Rank	-	1	-	2	-	-	-	

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 8 bones were listed as deer/antelope.
3. An additional 146 bones were listed as bison or domestic cow and antelope hairs were found in human coprolites.
4. Listed as 11-16 individual deer in site report.
5. An additional 25 individuals were listed as deer? and an additional 124 bones were listed as deer?.
6. An additional 50 bones were listed as probable deer and 5 more as probable elk.
7. Subtotal MNI/subtotal NISP.

Table 80. Ungulate remains recovered from archaeological sites in Washington state. Part 1: Minimum number of individuals.

Site	Total number of bones recovered	Number of bones identified to species	Percent of total bones identified to species	Minimum number of individuals (MNI)					
				Elk	Bison	Deer[1]	Antelope	Bighorn	Moose
Wawawai 45WT39 (2)	*	1,189	*	3	3	13	2	2	0
Alpowa locality									
45AS78 (3)	*	*	*	*	*	*	*	*	0
45AS80 (4)	*	*	*	*	*	*	*	*	0
45AS82 (5)	*	*	*	*	*	*	*	*	0
Total	*	2,459	*	6	9	35	6	9	0
Weis Rockshelter	*	320	*	*	*	*	*	*	0
Lind Coulee 45GR97	*	650	*	*	*	*	0	0	0
Salishan Mesa 45GR445 (6)	2,755	104	4%	0	*	*	*	*	0
Lyons Ferry 45FR36	8,085	62	0.8%	*	*	*	*	0	0
45SA11	34,132	5,709	17%	*	0	*	0	*	0
Layser Cave 45LE223 (7)	15,000	*	*	3	0	108	0	0	0
Riparia 45WT1	1,032	120	12%	4	2	1	1	0	0
Harder Site 45FR40	*	*	*	*	*	*	0	0	0
Judd Peak 45LE222 (8)	*	923	*	3	0	145	0	4	0
Marmes Rockshelter 45FR50	*	647	*	*	0	*	*	0	0

Table 80. (cont.)

Plouse River 45WT2	*	186	*	*	*	*	*	0	0
Granite Point 45WT41	*	592	*	*	*	*	*	0	0
Cow Creek 45AD2 (9)	15,439	3,300	21%	*	*	*	*	0	0
Avey's Orchard 45DO176	*	1,200	*	3	1	14	4	5	0
Boat Ramp 45CH212 (10)	5,050	427	8%	0	0	1	1	10	0
Miller Site 45FR5 (11)	46,806	1,287	3%	3	0	13	38	0	0
Ksunku 45FE45	*	*	*	*	0	*	0	*	0
Rocky Reach 6 sites (12)	10,902	176	2%	7	0	4	5	7	0
Corral Creek									
45OK196	1,159	27	2%	2	0	1	1	0	0
45OK197	35,000	1,762	5%	16	1	39	15	15	0
River Mile 590 8 sites	*	634	*	5	2	22	3	13	0
45DO189 (13)	*	*	*	*	0	*	*	*	0
45DO326	87,476	1,325	2%	1	0	2	1	2	0
45DO282	*	946	*	0	0	1	0	0	0
45OK11 (14)	295,679	8,042	3%	2	1	23	3	8	0

Table 80. (cont.)

45DO211 (15)	21,148	1,653	8%	0	0	1	0	1	0
45DO273	1,087	87	8%	1	0	1	0	0	0
450K258 (16)	407,155	10,874	3%	2	0	38	2	11	0
450K250 (17)	258,168	2,660	1%	1	0	13	0	4	0
450K4 (18)	207,790	2,969	1%	2	0	19	1	4	0
450K287-450K288(19)	56,125	1,559	3%	0	1	14	6	5	0
450K285 (20)	24,293	901	4%	4	2	4	0	4	0
450K214 (21)	55,993	1,370	5%	2	3	10	5	4	0
450K2-450K2A (22)	251,512	5,814	2%	4	0	19	4	4	0
Chief Joseph 9 sites	*	*	*	0	9	107	0	17	0
Totals	>1,828,286	>59,974	*	74	33	650	98	129	0
Percent of Total	-	-	-	8%	3%	66%	10%	13%	0%
Rank	-	-	-	4	5	1	3	2	6
Coastal Site 45JE16 (23)	*	*	*	*	0	*	0	0	0
Percent	-	-	-	-	-	-	-	-	-
Rank	-	-	-	-	-	-	-	-	-

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 222 bones were identified as deer sized and another 44 bones as elk/bison sized.
3. An additional 53 bones were identified as deer, pronghorn, and mountain sheep sized, and another 16 bones as bison, cow, and elk sized.

Table 80. (cont.)

4. An additional 101 bones were identified as deer, pronghorn, and mountain sheep sized and another 110 bones as bison, cow, and elk sized.
5. An additional 541 bones were identified as deer, pronghorn, and mountain sheep sized and another 167 bones as bison, cow, and elk sized.
6. An additional 24 bones were identified as deer sized while another 12 bones were listed as elk/bison sized.
7. Includes only teeth "... if identifiable long bones were added to NISP, the result would be a tremendous increase in deer ..." No elk teeth were recovered from the site. The 3 identified elk specimens are all long bones. An additional 5 bones and 4 individuals were listed as bighorn sheep/mountain goat (Oreamnos americanus).
8. An additional 944 bones were identified as deer/bighorn sheep/mountain goat.
9. An additional 511 bones were identified as deer/antelope.
10. An additional 946 bones were listed as medium artiodactyla while one bone was reported as a large artiodactyla.
11. An additional 19,069 bones were listed as deer/antelope/bighorn sheep while another 43 bones were identified as elk/bison.
12. An additional 1,483 bones were identified as deer/antelope/bighorn sheep while another 569 bones were listed as elk/bison.
13. An additional 748 bones were listed as deer sized while another 2 bones were recorded as elk sized.
14. An additional 2,059 bones were listed as deer sized, 296 as bighorn sheep/antelope, and 27 as elk sized.
15. An additional 38 bones were listed as deer sized.
16. An additional 5,515 bones were listed as deer sized while 16 others were recorded as elk sized.
17. An additional 990 bones were listed as deer sized while another 3 were listed as elk sized.
18. An additional 974 bones were listed as deer sized while another 3 were listed as elk sized.
19. An additional 643 bones were listed as deer sized while another 3 were recorded as elk sized.
20. An additional 37 bones were listed as deer sized while another 19 were recorded as elk sized.
21. An additional 278 bones were listed as deer sized while another 15 were recorded as elk sized.
22. An additional 1,643 bones were listed as deer sized, 21 as elk sized, and 160 as antelope/bighorn sheep.
23. In addition, 544 pieces of elk and deer antler were recovered.

Table 81. Ungulate remains recovered from archaeological sites in Washington state. Part 2: Number of identified specimens.

Site	Date	Number of identified specimens (NISP) Elk	Bison	Deer[1]	Antelope	Bighorn	Moose	Reference
Wawawai (2) 45WT39	1000-100BP	168	4	397	12	17	0	Yent 1976
Alpowa locality								
45AS78 (3)	6000-100BP	3	3	45	5	7	0	Lyman 1976
45AS80 (4)	2400-100BP	2	105	76	0	1	0	Brauner 1976
45AS82 (5)	6000-100BP	46	116	582	33	34	0	
Total	*	-	-	-	-	-	-	
Weis Rockshelter	7000-500BP	13	2	62	6	1	0	Butler 1962
Lind Coulee 45GR97	9000-100BP	30	162	9	0	0	0	Irwin and Moody 1978
Salishan Mesa 45GR445 (6)	2400-200BP	0	1	3	1	3	0	Masten 1988
Lyons Ferry 45FR36	2500-2100BP	4	19	1	2	0	0	Schalk 1983a
45SA11	800-100BP	387	0	1,614	0	1	0	Minor et al. 1986
Layser Cave 45LE223 (7)	7500-3500BP	3	0	468	0	0	0	Daugherty et al. 1987a
Riparia 45WT1	8000-2500BP	22	4	14	7	0	0	Miss and Cochran 1982
Harder Site 45FR40	2000-100BP	13	14	2	0	0	0	Kenaston 1966
Judd Peak 45LE222 (8)	7000-200BP	5	0	704	0	21	0	Daugherty et al. 1987b
Marmes Rockshelter 45FR50	10000-100BP	51	0	205	189	0	0	Gustafson 1972

Table 81. (cont.)

Plouse River 45WT2	9000-100BP	8	1	44	3	0	0	Gustafson 1972
Granite Point 45WT41	8000-100BP	74	5	210	11	0	0	Gustafson 1972
Cow Creek 45AD2 (9)	3000-200BP	37	22	*	*	0	0	Deaver and Greene 1978
Avey's Orchard 45DO176	1100-850BP	5	2	548	13	46	0	Galm and Masten 1985
Boat Ramp 45CH212 (10)	1450-150BP	0	0	20	6	268	0	Lothson et al. 1982
Miller Site 45FR5 (11)	1400-140BP	12	0	62	745	0	0	Olson 1983 Schalk 1983b
Ksunku 45FE45	6000-100BP	8	0	19	0	2	0	Chance et al. 1977 Chance and Chance 1982
Rocky Reach 6 sites (12)	8200-1200BP	33	0	7	9	38	0	Schalk and Mierendorf 1983
Corral Creek								
45OK196	4500-1000BP	4	0	22	1	0	0	Chatters 1984a
45OK197	1870-100BP	78	2	669	367	73	0	
River Mule 590 8 sites	5000-1600BP	6	2	261	4	25	0	Chatters 1984b
45DO189 (13)	3000BP	2	0	252	5	14	0	Galm and Lyman 1988
45DO326	5000-100B?	7	0	120	3	72	0	Lohse 1984a
45DO282	6000-4000BP	0	0	4	0	0	0	Lohse 1984b
45OK11 (14)	5100-2800BP	48	12	1,668	67	350	0	Lohse 1984c
45DO211 (15)	5500-2700BP	0	0	42	0	1	0	Lohse 1984d

Table 81. (cont.)

45DO273	5500-1000BP	1	0	6	0	0	0	Jaehnig 1984
45OK258 (16)	4000-100BP	14	0	3,452	42	511	0	Jaehnig 1985
45OK250 (17)	3500-2500BP	1	0	738	0	57	0	Miss 1984a
45OK4 (18)	4000-700BP	4	0	803	3	77	0	Miss 1984a
45OK287-45OK288 (19)	5000-400BP	0	1	278	92	391	0	Miss 1984b
45OK285 (20)	3000-100BP	17	12	30	0	15	0	Miss 1984c
45OK214 (21)	4000-1000BP	2	3	182	35	36	0	Miss 1984d
45OK2-45OK2A (22)	4000-100BP	7	0	2,021	16	51	0	Campbell 1984
Chief Joseph 9 sites	*	0	54	1,418	0	26	0	Osborne et al. 1952
Totals	10000-100BP	1,115	544	17,058	1,674	2,137	0	(984/22,528)[23]
Percent of Total	-	5%	2%	76%	7%	9%	0%	
Rank	-	4	5	1	3	2	6	
Coastal Site 45JE16 (24)	900-100BP	582	0	338	0	0	0	Blukis Onat 1976
Percent	-	63%	-	37%	-	-	-	
Rank	-	1	-	2	-	-	-	

Table 81. (cont.)

* Data were not presented in site report.
1. Includes both mule and white-tailed deer.
2. An additional 222 bones were identified as deer sized and another 44 bones as elk/bison sized.
3. An additional 53 bones were identified as deer, pronghorn, and mountain sheep sized, and another 16 bones as bison, cow, and elk sized.
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13. An additional 748 bones were listed as deer sized while another 2 bones were recorded as elk sized.
14. An additional 2,059 bones were listed as deer sized, 296 as bighorn sheep/antelope, and 27 as elk sized.
15. An additional 38 bones were listed as deer sized.
16. An additional 5,515 bones were listed as deer sized while 16 others were recorded as elk sized.
17. An additional 990 bones were listed as deer sized while another 3 were listed as elk sized.
18. An additional 974 bones were listed as deer sized while another 3 were listed as elk sized.
19. An additional 643 bones were listed as deer sized while another 3 were recorded as elk sized.
20. An additional 37 bones were listed as deer sized while another 19 were recorded as elk sized.
21. An additional 278 bones were listed as deer sized while another 15 were recorded as elk sized.
22. An additional 1,643 bones were listed as deer sized, 21 as elk sized, and 160 as antelope/bighorn sheep.
23. Total MNI/total NISP.
24. In addition, 544 pieces of elk and deer antler were recovered.

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April 26, 1990

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April 14, 1987

Charles Kay
Department of Fisheries and Wildlife
College of Natural Resources
Utah State University
Logan, Utah 84322

Dear Charles,

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Flora Nyland
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Logan, Utah 84322-5200
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4/17/90

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I would like to order another 5x7" B+W glossy print of F. Jay Haynes photo No. H-3080; please see attached photocopy.

I plan to use this photo as part of a repeat photo set (ie Haynes' 1893 photo will be matched with a 1988 photo to show changes in Tall willow communities) in a scientific paper which I have co-authored with Steve Chadde (U. of Montana). Our paper is entitled, "Tall willow communities on Yellowstones northern range: a test of the

"natural regulation" paradigm" to be published as a chapter in a book titled, The Greater Yellowstone Ecosystem: Balancing Man and Nature on America's Wildlands to be done by Yale University Press. Thus, I believe I also have to pay a use-fee for this photograph.

This photograph will also appear in my PhD Dissertation entitled, Yellowstone's Northern Elk Herd: a critical evaluation of the "Natural Regulation" paradigm. If this use requires an additional use-fee, please also bill me for that charge.

Since I am not sure what all this will total, I wonder if you would be

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I plan to use this photo as part of a repeat photoset (if Bradley's 1896-97 photo will be matched with a 1988 retake to show changes in Tall willow communities) in a scientific paper which I have co-authored with Steve Cladd (U. of Montana). Our paper is entitled, "Tall willow communities

on Yellowstone's northern range: a test of the 'natural regulation' paradigm" to be published as a chapter in a book by Yale University press entitled, The Greater Yellowstone Ecosystem: Balancing Man and Nature on America's Wildlands. Thus, I believe that I may also have to pay a use-fee for this photograph.

This photograph will also appear in my PhD Dissertation entitled, Yellowstone's Northern Elk Herd: a critical evaluation of the "Natural Regulation" paradigm which I hope to have done by late summer here at UCL. If this use requires an additional use-fee, please bill me for that charge.

Since I am not sure what all this will total, I wonder if you would be so kind as to bill me for what I owe and I then will send you a check for that amount.

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Sincerely yours,

Charles Kay

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(801) 750-2459

Dec. 1, 1990

Dr. Robert Jonas
Professor of Wildlife Biology
Department of Zoology
Washington State University
Pullman, WA 99164-4220

Dear Bob:

Per our correspondence of 4/8/86, 4/14/86, 5/7/86, 5/19,86, 6/4/86, 6/11/86, 11/11/86, 11/14,86, 11/26/86, 12/5/86, 2/16/87, 2/23/87, 6/4/87, 6/30,87, 2/8/88, as well as our meeting in Yellowstone National Park and various telephone calls; this letter confirms that you gave me verbal and written permission to use your photographs in my Ph.D. dissertation.

In my dissertation, I included two of your photographs which you originally used in your M.S. thesis. In your thesis, these photos appear as Figures 11 and 15 (pages 37 and 41). I used these photographs as part of a three-part repeat photo set (1921, 1954, 1986) to show the vegetation changes which have occurred in Yellowstone National Park during the last 65 years. Your photographs appear in my dissertation as part of Chapter 6 on Tall Willow Communities.

I will conclude by thanking you for your help with my Ph.D. project and for granting me permission to use your photographs.

Sincerely,

Charles Kay

Charles Kay

VITA

Charles Edward Kay

Candidate for the Degree of

Doctor of Philosophy

Dissertation: Yellowstone's Northern Elk Herd: A Critical Evaluation of the "Natural Regulation" Paradigm.

Major Field: Wildlife Ecology

Biographical Information:

Personal Data: Born at Chicago, Illinois, November 13, 1946, son of Edward C. and Sylvia Kay.

Education: Attended elementary school in Villa Park, Illinois, graduated from Willowbrook High School in 1964, received a Bachelor of Science degree with High Honors from the University of Montana, Missoula, Montana, with a major in wildlife science in 1968; 1973 completed the requirements for the Master of Science degree at the University of Montana, with a major in environmental sciences; 1990 completed the requirements for the Doctor of Philosophy degree at Utah State University, with a major in wildlife ecology.

Professional Experience: 1971-73, Research Assistant, Department of Botany, University of Montana; 1973-74, Research Associate at Environmental Studies Laboratory, University of Montana; 1975-77, Habitat Biologist, Alaska Department of Fish and Game, Fairbanks, Alaska; 1978-1990, self-employed as a consulting biologist and environmental expert.