

SUMMARY - ALL COVER TRANSECTS

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	N	# OF HITS	PERCENT COVER ALL CLASSES		PERCENT COVER WITHIN LIFE FORM
					MEAN	S.D.	
GRASS	AGINZ	AGROPYRON INTERMEDIUM	15	7	.9	2.6	6.1
	AGROP	AGROPYRON SP.	15	67	8.9	7.2	58.3
	AGSP3	AGROPYRON SPICATUM	15	23	3.1	3.9	20.0
	BRJET	BROMUS TECTORUM	15	1	.1	.5	.9
	ORHY	RYZOPSIS HYMENOIDES	15	8	1.1	2.0	7.0
	PG	PERENNIAL GRASS	15	8	1.1	2.0	7.0
	STIPA	STIPA SP.	15	1	.1	.5	.9
		SUBTOTAL	15	119	15.3	9.1	100.0
FORB	AF	ANNUAL FORB	15	6	.8	2.2	60.0
	ANTEN	ANTENNARIA SP.	15	1	.1	.5	10.0
	PF	PERENNIAL FORB	15	3	.4	1.1	30.0
		SUBTOTAL	15	10	1.3	3.2	100.0
SHRUB	AMUTU	AMELANCHIER UTAHENSIS	15	2	.3	.7	2.3
	ARTRT	ARTEMISIA TRIDENTATA	15	56	7.5	6.3	80.0
	ATCA	ATRIPLEX CANESCENS	15	1	.1	.5	1.4
	RIBES	RIBES SP.	15	2	.3	.7	2.9
	SYOC	SYMPHORICARPOS OCCIDENTALIS	15	9	1.2	2.0	12.9
		SUBTOTAL	15	70	9.3	6.4	100.0
TREE	ABLA	ABIES LASIOCARPA	15	1	.1	.5	.4
	ACGR	ACER GRANDIDENTATUM	15	6	.8	2.6	2.1
	JUDS	JUNIPERUS OSTEOSPERMA	15	4	.5	1.2	1.4
	PIED	PINUS EDULIS	15	1	.1	.5	.4
	PSHEM	PSEUDOTSUGA MENZIESII	15	4	.5	2.1	1.4
	OUGA	QUERCUS GAMBELII	15	268	35.7	12.2	94.4
		SUBTOTAL	15	284	37.9	12.1	100.0
SUCCULENT	OPPD	SPUNTIA POLYACANTHA	15	3	.4	.8	100.0
		SUBTOTAL	15	3	.4	.8	100.0
TOTAL			15	482	64.3	4.3	

BARE GROUND	15	23	3.1	4.7
LITTER-ROCK	15	245	32.7	5.6
VEGETATION, LITTER-ROCK	15	727	96.9	4.7

VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
GRASS	AGINI	AGROPYRON INTERMEDIUM	15	3	20.0
	AGROP	AGROPYRON SP.	15	13	86.7
	AGSP3	AGROPYRON SPICATUM	15	9	60.0
	BRTEY	BROMUS TECTORUM	15	1	6.7
	ORHY	ORYZOPSIS HYMENOIDES	15	4	26.7
	PG	PERENNIAL GRASS	15	4	26.7
	STIPA	STIPA SP.	15	1	6.7
		SUBTOTAL	15	15	100.0
FORB	AF	ANNUAL FORB	15	2	13.3
	ANTEN	ANTENNARIA SP.	15	1	6.7
	PF	PERENNIAL FORB	15	2	13.3
		SUBTOTAL	15	3	20.0
SHRUB	AMUTU	AMELANCHIER UTAHENSIS	15	2	13.3
	ARTRT	ARTEHISIA TRIDENTATA	15	12	80.0
	ATCA	ATRIplex CANESCENS	15	1	6.7
	RIBES	RIBES SP.	15	2	13.3
	SYOC	SYMPHORICARPOS OCCIDENTALIS	15	5	33.3
			SUBTOTAL	15	13
TREE	ABLA	ABIES LASTOCARPA	15	1	6.7
	ACGR	ACER GRANDIDENTATUM	15	2	13.3
	JUOS	JUNIPERUS OSTEOSPERMA	15	3	20.0
	PIED	PINUS EDULIS	15	1	6.7
	PSNEM	PSEUDOTSUGA MENZIESII	15	1	6.7
	QUGA	QUERCUS GAMBELII	15	15	100.0
			SUBTOTAL	15	15
SUCCULENT	OPPO	OPUNTIA POLYACANTHA	15	3	20.0
		SUBTOTAL	15	3	20.0

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 1.642

VARIANCE - .032

MAXIMUM INDEX - 3.091

EVENNESS - .531

NO OF SPECIES - 22

*** EVALUATION OF SAMPLING ADEQUACY ***

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 15

MEAN VEGETATION PERCENT COVER = 64.3

SAMPLE STANDARD DEVIATION = 6.3

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 3

Z STATISTIC = 2.79

CONFIDENCE LEVEL OBTAINED = 93.7 PERCENT

MEAN VEGETATION, LITTER-ROCK PERCENT COVER = 96.9

SAMPLE STANDARD DEVIATION = 4.7

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 1

Z STATISTIC = 5.63

CONFIDENCE LEVEL OBTAINED = 100.0 PERCENT

VEGETATION COVER, FREQUENCY, AND SPECIES DIVERSITY ESTIMATES

PRICE RIVER COAL COMPANY
HELPER, UTAH

BARN CANYON PINYON-JUNIPER
AFFECTED AREA
OCT/1981

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TRANSECT 1

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	5	10.0	20.8
	AGROP	AGROPYRON SP.	18	36.0	75.0
	PG	PERENNIAL GRASS	1	2.0	4.2
SUBTOTAL			24	48.0	100.0
FORB	ARLUL	ARTEMISIA LUDOVICIANA	1	2.0	100.0
		SUBTOTAL			1
SHRUB	ARTRT	ARTEMISIA TRIDENTATA	3	6.0	75.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	25.0
SUBTOTAL			4	8.0	100.0
TREE	PIED	PINUS EDULIS	1	2.0	50.0
	QUEA	QUERCUS GAMBELII	1	2.0	50.0
SUBTOTAL			2	4.0	100.0
TOTAL			31	62.0	
BARE GROUND			1	2.0	
LITTER-ROCK			18	36.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 2

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	1	1.0	5.3
	AGSM	AGROPYRON SMITHII	1	2.0	5.3
	AGPOP	AGROPYRON SP.	16	31.0	84.2
	PG	PERENNIAL GRASS	1	2.0	5.3
SUBTOTAL			19	38.0	100.0

SHR	RIBES	RIBES SP.			
			1	2.0	100.0
			SUBTOTAL	1	2.0
					100.0
TREE	ABCO	ABIES CONCOLOR	4	8.0	44.4
	ACER	ACER GRANDIDENTATUM	1	2.0	11.1
	JUOS	JUNIPERUS OSTEOSPERMA	4	8.0	44.4
			SUBTOTAL	9	18.0
					100.0
			TOTAL	29	58.0
BARE GROUND			7	14.0	
LITTER-ROCK			14	28.0	
VEGETATION, LITTER-ROCK			43	86.0	

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGNI	AGROPYRON INTERMEDIUM	1	2.0	7.7
	AGOP	AGROPYRON SP.	12	24.0	92.3
			SUBTOTAL	13	26.0
					100.0
TREE	JUCS	JUNIPERUS OSTEOSPERMA	5	10.0	45.5
	PIED	PINUS EOULIS	6	12.0	54.5
			SUBTOTAL	11	22.0
					100.0
			TOTAL	24	48.0
BARE GROUND			6	12.0	
LITTER-ROCK			20	40.0	
VEGETATION, LITTER-ROCK			44	88.0	

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGOP	AGROPYRON SP.	14	28.0	100.0
			SUBTOTAL	14	28.0
					100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	5	10.0	41.7
	JUOS	JUNIPERUS OSTEOSPERMA	4	8.0	33.3
	PIED	PINUS FOULIS	3	6.0	25.0

SUBTOTAL 12 24.0 100.0

TOTAL 26 52.0

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BARE GROUND 6 12.0
 LITTER-ROCK 18 36.0
 VEGETATION, LITTER-ROCK 44 88.0

TRANSECT 5

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGOP	AGROPYRON SP.	11	22.0	100.0
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SUBTOTAL 11 22.0 100.0

TREE	CELEL	CERCOCARPUS LEDIFOLIUS	5	10.0	33.3
	JUOS	JUNIPERUS OSTEOSPERMA	3	6.0	20.0
	PIED	PINUS EDLIS	5	10.0	33.3
	OUQA	QUERCUS GAMBELII	2	4.0	13.3

SUBTOTAL 15 30.0 100.0

TOTAL 26 52.0

BARE GROUND 3 6.0
 LITTER-ROCK 21 42.0
 VEGETATION, LITTER-ROCK 47 94.0

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGOP	AGROPYRON SP.	13	26.0	100.0
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SUBTOTAL 13 26.0 100.0

TREE	CELEL	CERCOCARPUS LEDIFOLIUS	4	12.0	50.0
	JUOS	JUNIPERUS OSTEOSPERMA	2	6.0	25.0
	PIED	PINUS EDLIS	4	12.0	50.0

SUBTOTAL 12 24.0 100.0

TOTAL 25 50.0

BARE GROUND 7 14.0

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	8	16.0	100.0
SUBTOTAL			8	16.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	5.3
	JUOS	JUNIPERUS OSTEDSPERMA	7	14.0	36.8
	PIED	PINUS EDULIS	5	10.0	26.3
	PSPEN	PSEUDOTSUGA MENZIESII	4	8.0	21.1
	QUFA	QUERCUS GAMBELII	2	4.0	10.5
SUBTOTAL			19	38.0	100.0
TOTAL			27	54.0	
BARE GROUND			3	6.0	
LITTER-ROCK			20	40.0	
VEGETATION, LITTER-ROCK			47	94.0	

TRANSECT 8

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	22	44.0	100.0
SUBTOTAL			22	44.0	100.0
TREE	PIED	PINUS EDULIS	2	4.0	40.0
	QUGA	QUERCUS GAMBELII	3	6.0	60.0
SUBTOTAL			5	10.0	100.0
TOTAL			27	54.0	
BARE GROUND			7	14.0	
LITTER-ROCK			16	32.0	
VEGETATION, LITTER-ROCK			43	86.0	

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	18	36.0	100.0
SUBTOTAL			18	36.0	100.0
TREE	JUCS	JUNIPERUS OSTEOSPERMA	2	4.0	33.3
	PIED	PINUS EDULIS	4	8.0	66.7
SUBTOTAL			6	12.0	100.0
TOTAL			24	48.0	
BARE GROUND			2	4.0	
LITTER-ROCK			24	48.0	
VEGETATION, LITTER-ROCK			48	96.0	

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TRANSECT 10

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	18	36.0	90.0
	ORHY	ORYZOPSIS HYMENOIDES	1	2.0	5.0
	PDA	POA SP.	1	2.0	5.0
SUBTOTAL			20	40.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	7.7
	JUCS	JUNIPERUS OSTEOSPERMA	4	8.0	30.8
	PIED	PINUS EDULIS	8	16.0	61.5
SUBTOTAL			13	26.0	100.0
TOTAL			33	66.0	
BARE GROUND			2	6.0	
LITTER-ROCK			14	28.0	
VEGETATION, LITTER-ROCK			47	94.0	

TRANSECT 11

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	15	30.0	93.6

POA	POA SP.	1	2.0	6.3	
		SUBTOTAL			
		16	32.0	100.0	
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	6	12.0	37.5
	JUCS	JUNIPERUS OSTEOSPERMA	3	6.0	18.8
	PIED	PINUS FULVIS	7	14.0	43.8
		SUBTOTAL			
		16	32.0	100.0	
		TOTAL			
		32	64.0		
BARE GROUND		5	10.0		
LITTER-ROCK		13	26.0		
VEGETATION, LITTER-ROCK		45	90.0		

TRANSECT 12

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	17	34.0	81.0
	ORHY	ORYZOPSIS HYMENOIDES	1	2.0	4.8
	POA	POA SP.	3	6.0	14.3
		SUBTOTAL			100.0
		21	42.0		
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	3	6.0	18.8
	JUCS	JUNIPERUS OSTEOSPERMA	13	26.0	81.3
		SUBTOTAL			100.0
		16	32.0		
		TOTAL			74.0
		37	74.0		
BARE GROUND		2	6.0		
LITTER-ROCK		10	20.0		
VEGETATION, LITTER-ROCK		47	94.0		

TRANSECT 13

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	17	34.0	77.3
	ORHY	ORYZOPSIS HYMENOIDES	2	4.0	9.1
	POA	POA SP.	3	6.0	13.6
		SUBTOTAL			100.0
		22	44.0		
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	100.0

SUBTOTAL 2 2.0 100.0

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TOTAL 23 46.0

BARE GROUND 14 29.0
 LITTER-ROCK 13 26.0
 VEGETATION, LITTER-ROCK 36 72.0

TRANSECT 14

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	3	6.0	25.0
	AGROP	AGROPYRON SP.	9	18.0	75.0
SUBTOTAL			12	24.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	9	18.0	50.0
	JUDS	JUNIPERUS OSTEOSPERMA	3	6.0	16.7
	PIFD	PINUS FOULIS	6	12.0	33.3
SUBTOTAL			18	36.0	100.0
TOTAL			30	60.0	
BARE GROUND			7	14.0	
LITTER-ROCK			13	26.0	
VEGETATION, LITTER-ROCK			43	86.0	

TRANSECT 15

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	10.0
	AGROP	AGROPYRON SP.	18	36.0	90.0
SUBTOTAL			20	40.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	7.7
	JUDS	JUNIPERUS OSTEOSPERMA	8	16.0	61.5
	PIFD	PINUS FOULIS	4	8.0	30.8
SUBTOTAL			13	26.0	100.0
TOTAL			33	66.0	

BARE GROUND

11 22.0

LITTER-ROCK

6 12.0

VEGETATION, LITTER-ROCK

39 78.0

SUMMARY - ALL COVER TRANSECTS

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	N	# OF HITS	PERCENT COVER ALL CLASSES		PERCENT COVER
					MEAN	S.D.	WITHIN LIFE FORM
GRASS	AGNI	AGROPYRON INTERPEDIUM	15	12	1.6	2.9	4.7
	AGSM	AGROPYRON SMITHII	15	1	.1	.5	.4
	AGFOP	AGROPYRON SP.	15	226	30.1	7.7	69.3
	ORHY	ORYZOPSIS HYMENOIDES	15	4	.5	1.2	1.6
	PGA	PERENNIAL GRASS	15	2	.3	.7	.8
	POA	POA SP.	15	8	1.1	2.1	3.2
		SUBTOTAL	15	253	33.7	6.6	100.0
0							
FORB	ARLUL	ARTEMISIA LUDOVICIANA	15	1	.1	.5	100.0
		SUBTOTAL	15	1	.1	.5	100.0
0							
SHRUB	ARTR	ARTEMISIA TRIDENTATA	15	3	.4	1.5	60.0
	RRES	RIRES SP.	15	1	.1	.5	20.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	15	1	.1	.5	20.0
		SUBTOTAL	15	5	.7	2.1	100.0
0							
TREE	ABCO	ABIES CONCOLOR	15	4	.5	2.1	2.4
	ACCR	ACER GRANDIDENTATUM	15	1	.1	.5	.6
	CELE	CERCOCARPUS LEDIFOLIUS	15	38	5.1	5.8	22.6
	JUCS	JUNIPERUS OSTEOSPERMA	15	58	7.7	6.9	34.5
	PIFD	PINUS EDULIS	15	55	7.3	5.2	32.7
	PSPEN	PSEUDOTSUGA MENZIESII	15	4	.5	2.1	2.4
	QUGA	QUERCUS GARRELI	15	8	1.1	2.0	4.8
		SUBTOTAL	15	168	22.4	11.1	100.0
0							
		TOTAL	15	427	56.9	6.2	
BARE GROUND			15	85	11.3	7.0	
LITTER-ROCK			15	238	31.7	9.3	
VEGETATION, LITTER-ROCK			15	665	88.7	7.0	

VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
GRASS	AGNI	AGROPYRON INTERMEDIUM	15	5	33.3
	AGSM	AGROPYRON SMITHII	15	1	6.7
	AGFP	AGROPYRON SP.	15	15	100.0
	DRHY	DRYZOPSIS HYMENOIDES	15	3	20.0
	PG	PERENNIAL GRASS	15	2	13.3
	POA	POA SP.	15	4	26.7
SUBTOTAL			15	15	100.0
FORB	ARLUL	ARTEMISIA LUDOVICIANA	15	1	6.7
	SUBTOTAL			15	1
SHRUB	ARTRT	ARTEMISIA TRIDENTATA	15	1	6.7
	RIBES	RIBES SP.	15	1	6.7
	SYDC	SYMPHORICARPOS OCCIDENTALIS	15	1	6.7
	SUBTOTAL			15	2
TREE	ARCO	ABIES CONCOLOR	15	1	6.7
	ACFR	ACER GRANDIDENTATUM	15	1	6.7
	CFLEL	CERCOCARPUS LEDIFOLIUS	15	10	66.7
	JUDS	JUNIPERUS OSTEOSPERMA	15	12	80.0
	PIED	PINUS FOLLIS	15	12	80.0
	PSPFM	PSEUDOTSUGA MENZIESII	15	1	6.7
	OUGA	QUERCUS GAMBELII	15	4	26.7
	SUBTOTAL			15	15
TOTAL			15	15	100.0

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 1.509
 VARIANCE - .027

MAXI INDEX - 2.833
EVEN - .514
NO OF SPECIES - 17

**** EVALUATION OF SAMPLING ADEQUACY ****

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 15

MEAN VEGETATION PERCENT COVER = 56.9

SAMPLE STANDARD DEVIATION = 8.2

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 7

Z STATISTIC = 1.91

CONFIDENCE LEVEL OBTAINED = 97.2 PERCENT

MEAN VEGETATION, LITTER-POCK PERCENT COVER = 88.7

SAMPLE STANDARD DEVIATION = 7.0

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 2

Z STATISTIC = 3.49

CONFIDENCE LEVEL OBTAINED = 100.0 PERCENT

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VEGETATION COVER, FREQUENCY, AND SPECIES DIVERSITY ESTIMATES

PRICE RIVER COAL COMPANY
HELPER, UTAH

CRANDALL PINYON-JUNIPER
REFERENCE SITE
OCTOBER 1981

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TRANSECT 1

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	7	14.0	46.7
	AGROP	AGROPYRON SP.	8	16.0	53.3
SUBTOTAL			15	30.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	10	20.0	76.9
	PIED	PINUS EDULIS	2	4.0	15.4
	OUGA	QUERCUS GAMBELII	1	2.0	7.7
SUBTOTAL			13	26.0	100.0
TOTAL			28	56.0	
BARE GROUND			1	2.0	
LITTER-ROCK			21	42.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 2

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	18.2
	AGROP	AGROPYRON SP.	8	16.0	72.7
	ORHY	RYZOPSIS HYMENOIDES	1	2.0	9.1
SUBTOTAL			11	22.0	100.0
FORB	AF	ANNUAL FORB	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	10	20.0	62.5
	JUDS	JUNIPERUS OSTEOSPERMA	2	6.0	18.8
	PIED	PINUS EDULIS	3	6.0	18.8
SUBTOTAL			16	32.0	100.0

TOTAL	26	56.0
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BARE GROUND	3	6.0
LITTER-ROCK	19	38.0
VEGETATION, LITTER-ROCK	47	94.0

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	25.0
	AGROP	AGROPYRON SP.	6	12.0	75.0
SUBTOTAL			8	16.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	3	6.0	15.8
	JUOS	JUNIPERUS OSTEOSPERMA	9	18.0	47.4
	PIED	PINUS EDULIS	7	14.0	36.8
SUBTOTAL			19	38.0	100.0
TOTAL			27	54.0	

BARE GROUND	8	16.0
LITTER-ROCK	15	30.0
VEGETATION, LITTER-ROCK	42	84.0

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	13.3
	AGSM	AGROPYRON SMITHII	1	2.0	6.7
	AGROP	AGROPYRON SP.	12	24.0	80.0
SUBTOTAL			15	30.0	100.0
FORB	PHLOX	PHLOX SP.	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
SHRUB	CHVIV	CHRYSOTHAMNUS VISCIDIFLORUS	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TREE	PIED	PINUS EDULIS	8	16.0	61.9
	QUGA	QUERCUS GAMBELII	5	10.0	38.5

SUBTOTAL

13

26.0

100.0

228

TOTAL

30

60.0

BARE GROUND

5

10.0

LITTER-ROCK

15

30.0

VEGETATION, LITTER-ROCK

45

90.0

TRANSECT 5

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	PERCENT COVER
				ALL CLASSES	WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	11.1
	AGSM	AGROPYRON SMITHII	2	4.0	11.1
	AGROP	AGROPYRON SP.	13	26.0	72.2
	ORHY	DRYZOPSIS HYMENOIDES	1	2.0	5.6
SUBTOTAL			16	36.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	4	8.0	44.4
	JUDS	JUNIPERUS OSTEOSPERMA	5	10.0	55.6
SUBTOTAL			9	18.0	100.0
TOTAL			27	54.0	
BARE GROUND			7	14.0	
LITTER-ROCK			16	32.0	
VEGETATION, LITTER-ROCK			43	86.0	

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	PERCENT COVER
				ALL CLASSES	WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	4	8.0	100.0
SUBTOTAL			4	8.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	4.2
	JUDS	JUNIPERUS OSTEOSPERMA	9	18.0	37.5
	PIED	PINUS EDULIS	6	16.0	33.3
	QUGA	QUERCUS GAMBELII	6	12.0	25.0
SUBTOTAL			24	49.0	100.0
TOTAL			28	56.0	

BARE GROUND			6	12.0
LITTER-ROCK			16	32.0
VEGETATION, LITTER-ROCK			44	88.0

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	6	12.0	100.0
		SUBTOTAL	6	12.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	2	4.0	10.5
	JUOS	JUNIPERUS OSTEOSPERMA	11	22.0	57.9
	PSMEM	PSEUDOTSUGA MENZIESII	6	12.0	31.6
		SUBTOTAL	19	38.0	100.0
		TOTAL	25	50.0	

BARE GROUND			3	6.0
LITTER-ROCK			22	44.0
VEGETATION, LITTER-ROCK			47	94.0

TRANSECT 8

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	3	6.0	100.0
		SUBTOTAL	3	6.0	100.0
TREE	PSMEM	PSEUDOTSUGA MENZIESII	9	18.0	36.0
	OUGA	QUERCUS GAMBELII	16	32.0	44.0
		SUBTOTAL	25	50.0	100.0
		TOTAL	28	56.0	

BARE GROUND			6	12.0
LITTER-ROCK			16	32.0
VEGETATION, LITTER-ROCK			44	88.0

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGNI	AGROPYRON INTERMEDIUM	1	2.0	12.5
	AGRP	AGROPYRON SP.	7	14.0	87.5
SUBTOTAL			8	16.0	100.0
TREE	CELE	CERCOCARPUS LEDIFOLIUS	3	6.0	19.8
	PIED	PINUS EDULIS	13	26.0	81.3
SUBTOTAL			16	32.0	100.0
TOTAL			24	48.0	
BARE GROUND			9	18.0	
LITTER-ROCK			17	34.0	
VEGETATION, LITTER-ROCK			41	82.0	

230

TRANSECT 10

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGNI	AGROPYRON INTERMEDIUM	4	8.0	57.1
	AGRP	AGROPYRON SP.	2	4.0	28.6
	ORHY	DRYZOPSIS HYMENIODES	1	2.0	14.3
SUBTOTAL			7	14.0	100.0
TREE	CELE	CERCOCARPUS LEDIFOLIUS	3	6.0	16.7
	JUOS	JUNIPERUS OSTEOSPERMA	2	4.0	11.1
	PIED	PINUS EDULIS	13	26.0	72.2
SUBTOTAL			18	36.0	100.0
TOTAL			25	50.0	
BARE GROUND			6	12.0	
LITTER-ROCK			15	30.0	
VEGETATION, LITTER-ROCK			44	88.0	

TRANSECT 11

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGNI	AGRYPYRON INTERMEDIUM	3	6.0	15.0
	AGROP	AGRYPYRON SP.	15	30.0	75.0
	POA	POA SP.	2	4.0	10.0
SUBTOTAL			20	40.0	100.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	5	10.0	100.0
SUBTOTAL			5	10.0	100.0
TOTAL			25	50.0	
BARE GROUND			1	2.0	
LITTER-ROCK			24	48.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 12

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGRYPYRON SP.	5	10.0	71.4
	ORHY	RYZOPSIS HYMENOIDES	2	4.0	28.6
SUBTOTAL			7	14.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	9	18.0	45.0
	JUOS	JUNIPERUS OSTEOSPERMA	6	12.0	30.0
	OUGA	QUERCUS GAMBELII	5	10.0	25.0
SUBTOTAL			20	40.0	100.0
TOTAL			27	54.0	
BARE GROUND			4	8.0	
LITTER-ROCK			19	38.0	
VEGETATION, LITTER-ROCK			46	92.0	

TRANSECT 13

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGRYPYRON SP.	9	18.0	100.0
SUBTOTAL			9	18.0	100.0
TREE	CELEL	CERCOCARPUS LEDIFOLIUS	9	18.0	56.3
	JUOS	JUNIPERUS OSTEOSPERMA	7	14.0	43.8

SUBTOTAL

16

32.0

100.0

232

TOTAL

25

50.0

BARE GROUND
LITTER-ROCK

4

8.0

VEGETATION, LITTER-ROCK

21

42.0

46

92.0

TRANSECT 14

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS

AGINI
AGROPAGRJPYRON INTERMEDIUM
AGRJPYRON SP.3
56.0
10.037.5
62.5

SUBTOTAL

8

16.0

100.0

TREE

PIED

PINJS EDULIS

16

32.0

100.0

SUBTOTAL

16

32.0

100.0

TOTAL

24

48.0

BARE GROUND
LITTER-ROCK

6

12.0

VEGETATION, LITTER-ROCK

20

40.0

44

88.0

TRANSECT 15

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS

AGINI
AGROP
DRHY
POAAGRJPYRON INTERMEDIUM
AGROPYRON SP.
JRYZOPSIS HYMENOIDES
POA SP.4
5
3
38.0
10.0
6.0
6.026.7
33.3
20.0
20.0

SUBTOTAL

15

30.0

100.0

TREE

JUDS
OUGAJUNIPERUS OSTEOSPERMA
QUERCUS GAMBELII5
710.0
14.041.7
58.3

SUBTOTAL

12

24.0

100.0

TOTAL

27

54.0

BARE GROUND

5

10.0

SUMMARY - ALL COVER TRANSECTS

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	N # OF HITS		PERCENT COVER ALL CLASSES		PERCENT COVER WITHIN LIFE FORM
					MEAN	S.D.	
GRASS	AGINI	AGRYPYRON INTERMEDIUM	15	30	4.0	4.0	19.5
	AGSM	AGROPYRON SMITHII	15	3	.4	1.1	1.9
	AGROP	AGRYPYRON SP.	15	108	14.4	7.5	70.1
	ORHY	TRYZOPSIS HYMENOIDES	15	8	1.1	1.8	5.2
	PDA	PDA SP.	15	5	.7	1.8	3.2
		SUBTOTAL	15	154	20.5	10.3	100.0
FORB	AF	ANNUAL FORB	15	1	.1	.5	50.0
	PHLOX	PHLOX SP.	15	1	.1	.5	50.0
		SUBTOTAL	15	2	.3	.7	100.0
SHRUB	CHVIV	CHRYSOTHAMNUS VISCIDIFLORUS	15	1	.1	.5	100.0
		SUBTOTAL	15	1	.1	.5	100.0
TREE	CELEL	CEROCARPUS LEDIFOLIUS	15	54	7.2	7.8	22.4
	JUOS	JUNIPERUS OSTEOSPERMA	15	62	8.3	7.6	25.7
	PIED	PINUS EDULIS	15	70	9.3	11.4	29.0
	PSHEM	PSEUDOTSUGA MENZIESII	15	15	2.0	5.4	6.2
	OUGA	QUERCUS GAMBELII	15	40	5.3	9.0	16.6
		SUBTOTAL	15	241	32.1	10.5	100.0
		TOTAL	15	398	53.1	3.5	
BARE GROUND			15	74	9.9	4.6	
LITTER-ROCK			15	278	37.1	5.4	
VEGETATION, LITTER-ROCK			15	676	90.1	4.6	

VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
GRASS	AGINI	AGROPYRON INTERMEDIUM	15	10	66.7
	AGSM	AGROPYRON SMITHII	15	2	13.3
	AGROP	AGROPYRON SP.	15	15	100.0
	ORHY	RYZOPSTIS HYMENDIDES	15	5	33.3
	POA	POA SP.	15	2	13.3
SUBTOTAL			15	15	100.0
FORB	AF	ANNUAL FORB	15	1	6.7
	PHLOX	PHLOX SP.	15	1	6.7
SUBTOTAL			15	2	13.3
SHRUB	CHVIV	CHRYSOTHAMNUS VISCIDIFLORUS	15	1	6.7
SUBTOTAL			15	1	6.7
TREE	CELEL	CEROCARPUS LEDIFOLIUS	15	10	66.7
	JUDS	JUNIPERUS OSTEOSPERMA	15	10	66.7
	PIED	PINUS EDULIS	15	9	53.3
	PSHEM	PSEUDOTSUGA MENZIESII	15	2	13.3
	QUGA	QUERCUS GAMBELII	15	6	40.0
SUBTOTAL			15	15	100.0
TOTAL			15	15	100.0

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 1.985
 VARIANCE - .011
 MAXIMUM INDEX - 2.565
 EVENNESS - .774
 NO OF SPECIES - 13

*** EVALUATION OF SAMPLING ADEQUACY ***

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 15

MEAN VEGETATION PERCENT COVER = 59.1

SAMPLE STANDARD DEVIATION = 3.5

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 1

Z STATISTIC = 4.11

CONFIDENCE LEVEL OBTAINED = +100.0 PERCENT

MEAN VEGETATION, LITTER-ROCK PERCENT COVER = 90.1

SAMPLE STANDARD DEVIATION = 4.6

MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 1

Z STATISTIC = 5.33

CONFIDENCE LEVEL OBTAINED = 100.0 PERCENT



VEGETATION COVER, FREQUENCY, AND SPECIES DIVERSITY ESTIMATES

PRIMERO RIVER COAL COMPANY
HELPER, UTAH

CASTLE GATE RIPARIAN
REFERENCE SITE
JULY 1981

TRANSECT 1

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	2	4.0	40.0
	ORHY	DRYZOPSIS HYEMIDIDES	3	6.0	60.0
	SUBTOTAL		5	10.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	7.7
	CLL12	CLEMATIS LINGUSTICIFOLIA	5	10.0	38.5
	GLLE	GLYCYRRHIZA LEPIDOTA	1	2.0	7.7
	SAKA	SALSOLA KALI	2	4.0	15.4
	SHRAA	SMILACINA RACEMOSA	4	8.0	30.8
SUBTOTAL		13	26.0	100.0	
TREE	OUGA	QUERCUS GAMBELII	5	10.0	100.0
SUBTOTAL		5	10.0	100.0	
TOTAL			23	46.0	
BARE GROUND			11	22.0	
LITTER-ROCK			16	32.0	
VEGETATION, LITTER-ROCK			39	78.0	

TRANSECT 2

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	6	12.0	100.0
	SUBTOTAL		6	12.0	100.0
FORB	CLL12	CLEMATIS LINGUSTICIFOLIA	4	8.0	33.3
	COAR2	CONVOLVULUS ARVENSIS	3	6.0	25.0
	IVAX	IVA AXILLARIS	1	2.0	8.3
	SAKA	SALSOLA KALI	4	8.0	33.3
	SUBTOTAL		12	24.0	100.0



SHRU	AMUTU	AMELANCHIER UTAHENSIS	1	2.0	20.0
	CDSTS	CORNUS STOLONIFERA	4	8.0	80.0
			5	10.0	100.0

TREE	POAN	POPULUS ANGUSTIFOLIA	2	4.0	100.0
			2	4.0	100.0

		TOTAL	25	50.0	
BARE GROUND			14	28.0	
LITTER-ROCK			11	22.0	
VEGETATION, LITTER-ROCK			36	72.0	

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	4	8.0	66.7
	POA	POA SP.	2	4.0	33.3
			6	12.0	100.0

FORD	APANP	APOCYNUM ANDROSAEMIFOLIUM	2	4.0	16.7
	CLL12	CLEMATIS LINGUSTICIFOLIA	5	10.0	41.7
	GLLE	GLYCYRRHIZA LEPIDOTA	2	4.0	16.7
	IVAX	IVA AXILLARIS	2	4.0	16.7
	SOLID	SOLIDAGO SP.	1	2.0	8.3
			12	24.0	100.0

SHRUB	AMUTU	AMELANCHIER UTAHENSIS	1	2.0	20.0
	RHRA	RHUS PADICANS	1	2.0	20.0
	RHRT	RHUS TRILOBATA	1	2.0	20.0
	ROSA	ROSA SP.	1	2.0	20.0
	SALIX	SALIX SP.	1	2.0	20.0
			5	10.0	100.0

TREE	POAN	POPULUS ANGUSTIFOLIA	8	16.0	72.7
	QUGA	QUERCUS GAMBELII	3	6.0	27.3
			11	22.0	100.0

		TOTAL	34	68.0	
BARE GROUND			12	24.0	
LITTER-ROCK			4	8.0	
VEGETATION, LITTER-ROCK			36	76.0	

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	1	2.0	14.3
	BRTET	BROMUS TECTORUM	5	10.0	71.4
	PG	PERENNIAL GRASS	1	2.0	14.3
SUBTOTAL			7	14.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	14.3
	CHENO	CHENOPODIUM SP.	1	2.0	14.3
	CLL12	CLEMATIS LINGUSTICIFOLIA	1	2.0	14.3
	DESCU	DESCURAINIA SP.	1	2.0	14.3
	IVAX	IVA AXILLARIS	1	2.0	14.3
	SOLID	SOLIDAGO SP.	2	4.0	28.6
SUBTOTAL			7	14.0	100.0
SHRUB	RHRT	RHUS TRILOBATA	5	10.0	100.0
SUBTOTAL			5	10.0	100.0
TREE	PDAN	POPULUS ANGUSTIFOLIA	11	22.0	78.6
	QUGA	QUERCUS GAMBELII	3	6.0	21.4
SUBTOTAL			14	28.0	100.0
TOTAL			33	66.0	
BARE GROUND			12	24.0	
LITTER-ROCK			5	10.0	
VEGETATION, LITTER-ROCK			30	76.0	

240

TRANSECT 5

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	9	18.0	69.2
	DRHY	DRYZOPSIS HYMENOIDES	1	2.0	7.7
	STC03	STIPA COMATA	3	6.0	23.1
SUBTOTAL			13	26.0	100.0
FORB	CHENO	CHENOPODIUM SP.	1	2.0	7.7
	COAR2	CONVOLVULUS ARVENSIS	9	18.0	69.2
	GRSQ	GRINDELIA SQUARROSA	2	4.0	15.4
	IVAX	IVA AXILLARIS	1	2.0	7.7
SUBTOTAL			13	26.0	100.0

TOTAL 26 52.0

BARE GROUND 18 36.0
 LITTER-ROCK 6 12.0
 VEGETATION, LITTER-ROCK 32 64.0

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS	AGROP	AGROPYRON SP.	5	10.0	35.7
	BRTET	BROMUS TECTORUM	4	8.0	28.6
	STCO3	STIPA COMATA	5	10.0	35.7
SUBTOTAL			14	28.0	100.0

FORB	AF	ANNUAL FORB	1	2.0	8.3
	ASTER	ASTER SP.	1	2.0	8.3
	CLL12	CLEMATIS LINGUSTICIFOLIA	5	10.0	41.7
	SAKA	SALSOLA KALI	4	8.0	33.3
	SHRAA	SMILACINA RACEMOSA	1	2.0	8.3
SUBTOTAL			12	24.0	100.0

TREE	POAN	POPULUS ANGUSTIFOLIA	6	12.0	100.0
SUBTOTAL			6	12.0	100.0

TOTAL 32 64.0

BARE GROUND 8 16.0
 LITTER-ROCK 10 20.0
 VEGETATION, LITTER-ROCK 42 84.0

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS	AGROP	AGROPYRON SP.	2	4.0	16.7
	BRTET	BROMUS TECTORUM	9	18.0	75.0
	STCO3	STIPA COMATA	1	2.0	8.3
SUBTOTAL			12	24.0	100.0

FORB	CLL12	CLEMATIS LINGUSTICIFOLIA	6	12.0	75.0
	LAOC	LAPPULA OCCIDENTALIS	1	2.0	12.5
	SIAL	SISYMBRIUM ALTISSIMUM	1	2.0	12.5

SUBTOTAL 8 16.0 100.0

241

TREE	QUGA	QUERCUS GAMBELII	6	12.0	100.0
SUBTOTAL			6	12.0	100.0
TOTAL			26	52.0	
BARE GROUND			13	26.0	
LITTER-ROCK			11	22.0	
VEGETATION, LITTER-ROCK			37	74.0	

TRANSECT 8

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
FORB	COAR2	CONVOLVULUS ARPENSIS	13	26.0	72.2
	LAOC	LAPPULA OCCIDENTALIS	1	2.0	5.6
	SAKA	SALSOLA KALI	4	8.0	22.2
SUBTOTAL			18	36.0	100.0
TOTAL			19	38.0	
BARE GROUND			25	50.0	
LITTER-ROCK			6	12.0	
VEGETATION, LITTER-ROCK			25	50.0	

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	6	12.0	65.7
	ORHY	TRYZOPSIS HYMENOIDES	1	2.0	14.3
SUBTOTAL			7	14.0	100.0
FORB	AF	ANNUAL FORB	2	6.0	18.8
	APANP	APOCYNUM ANDROSAEMIFOLIUM	2	4.0	12.5
	ASTER	ASTER SP.	4	8.0	25.0
	CLL12	CLEMATIS LINGUSTICIFOLIA	2	4.0	12.5
	GLLE	GLYCYRRHIZA LEPIDOTA	2	4.0	12.5
	SIAL	SISYMBRIUM ALTISSIMUM	3	6.0	18.8
SUBTOTAL			16	32.0	100.0

244

			SUBTOTAL	5	10.0	100.0
TREE	POAN	POPULUS ANGUSTIFOLIA		7	14.0	77.9
	ULPA	ULMUS PARVIFOLIA		2	4.0	22.2
			SUBTOTAL	9	18.0	100.0
			TOTAL	23	46.0	
BARE GROUND				15	30.0	
LITTER-ROCK				12	24.0	
VEGETATION, LITTER-ROCK				35	70.0	

TRANSECT 12

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM	
GRASS	AERDP	AGRIOPYRON SP.	1	2.0	11.1	
	BRTET	ERODIUM CECIDIUM	7	14.0	77.9	
	HOJUS	ERODIUM CECIDIUM	1	2.0	11.1	
			SUBTOTAL	9	18.0	100.0
FORB	APAMP	APOCYNUM ANDROSAEMIFOLIUM	1	2.0	25.0	
	CLLIZ	CLEMATIS LINGUSTICIFOLIA	2	4.0	50.0	
	OKLI	XYRAPHUS LINEARIS	1	2.0	25.0	
			SUBTOTAL	4	8.0	100.0
SHRUB	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	2	4.0	11.8	
	RHTRT	RHUS TRILOBATA	7	14.0	41.2	
	ROSA	ROSA SP.	4	8.0	23.5	
	SALIX	SALIX SP.	4	8.0	23.5	
			SUBTOTAL	17	34.0	100.0
TREE	QUGA	QUERCUS GAMBELII	2	4.0	100.0	
			SUBTOTAL	2	4.0	100.0
			TOTAL	32	64.0	
BARE GROUND				2	4.0	
LITTER-ROCK				16	32.0	
VEGETATION, LITTER-ROCK				48	96.0	

TRANSECT 13

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGROP	AGRYPYRON SP.	1	2.0	33.3
	BRTEY	BROTIUS TECTORUM	2	4.0	66.7
SUBTOTAL			3	6.0	100.0
FORB	KOSC	KOCHIA SCOPARIA	1	2.0	6.7
	HEAL	MELILOTUS ALBA	13	26.0	86.7
	RUCR	RUMEX CRISPUS	1	2.0	6.7
SUBTOTAL			15	30.0	100.0
SHRUB	RHRT	RHUS TRILOBATA	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TREE	ACGLG	ACER GLABRUM	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TOTAL			20	40.0	
BARE GROUND			20	40.0	
LITTER-ROCK			10	20.0	
VEGETATION, LITTER-ROCK			30	60.0	

TRANSECT 14

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTEY	BROTIUS TECTORUM	11	22.0	91.7
	HQJUU	HORDEUM JUBATUM	1	2.0	8.3
SUBTOTAL			12	24.0	100.0
FORB	AF	ANNUAL FORB	1	2.0	14.3
	APANP	APOCYNUM ANDROSAEMIFOLIUM	1	2.0	14.3
	ASTRA	ASTRAGALUS SP.	1	2.0	14.3
	HEAL	MELILOTUS ALBA	2	4.0	28.6
	PF	PERENNIAL FORB	1	2.0	14.3
	SAKA	SALSOLA KALI	1	2.0	14.3
SUBTOTAL			7	14.0	100.0
SHRUB	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	2	4.0	18.2
	ROSA	ROSA SP.	1	2.0	9.1
	SALIX	SALIX SP.	8	16.0	72.7
SUBTOTAL			11	22.0	100.0
TREE	QUGA	QUERCUS GAMBELII	2	4.0	100.0
SUBTOTAL			2	4.0	100.0

245

	TOTAL	32	64.0
BARE GROUND		5	10.0
LITTER-ROCK		13	26.0
VEGETATION, LITTER-ROCK		45	90.0

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TRANSECT 15

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	8	16.0	88.9
	DRNY	JRYZOPSIS HYMENOIDES	1	2.0	11.1
		SUBTOTAL	9	18.0	100.0
FORB	AF	ANNUAL FORB	1	2.0	33.3
	ASTER	ASTER SP.	1	2.0	33.3
	CLL12	CLENATIS LINGUSTICIFOLIA	1	2.0	33.3
		SUBTOTAL	3	6.0	100.0
SHRUB	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	2	4.0	16.7
	RHRTT	RHUS TRILOBATA	1	2.0	6.3
	SALIX	SALIX SP.	9	18.0	75.0
		SUBTOTAL	12	24.0	100.0
TREE	QUGA	QUERCUS GAMBELII	3	6.0	100.0
		SUBTOTAL	3	6.0	100.0
		TOTAL	27	54.0	
BARE GROUND			6	12.0	
LITTER-ROCK			17	34.0	
VEGETATION, LITTER-ROCK			44	88.0	

SUMMARY - ALL COVER TRANSECTS

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	N	# OF HITS	PERCENT COVER		PERCENT COVER
					ALL CLASSES	WITHIN LIFE FORM	
					MEAN	S.D.	
GRASS	AGROP	AGRIPYRON SP.	15	10	1.3	2.7	6.6

BRTET	BRDMUS TECTORUM	15	74	9.9	6.9	71.2
HQJUL	HORDEUM JUBATUM	15	2	.3	.7	1.9
ORHY	ORYZOPSIS HYMENOIDES	15	6	.9	1.7	5.8
PG	PERENNIAL GRASS	15	1	.1	.5	1.0
POA	POA SP.	15	2	.3	1.0	1.9
STCO3	STIPA COMATA	15	9	1.2	2.9	8.7

0 SUBTOTAL 15 104 13.9 9.2 100.0

FORB

AF	ANNUAL FORB	15	6	.8	1.7	3.9
APANP	APOCYNUM ANDROSAEMIFOLIUM	15	6	.9	1.5	3.9
ASTER	ASTER SP.	15	14	1.9	3.5	9.1
ASTRA	ASTRAGALUS SP.	15	1	.1	.5	.6
CHENO	CHENOPODIUM SP.	15	2	.3	.7	1.3
CLLI2	CLENATIS LINGUSTICIFOLIA	15	37	4.9	4.3	24.0
COAR2	CONVOLVULUS ARVENSIS	15	25	3.3	7.9	16.2
DESCU	DESCURAINIA SP.	15	1	.1	.5	.6
GLLE	GLYCYRRHIZA LEPIDOTA	15	5	.7	1.4	3.2
GRSQ	GRINDELIA SQUARROSA	15	2	.3	1.0	1.3
IVAX	IVA AXILLARIS	15	5	.7	1.2	3.2
KOSC	KOCHIA SCOPARIA	15	1	.1	.5	.6
LADC	LAPPULA OCCIDENTALIS	15	2	.3	.7	1.3
HEAL	HELILOTUS ALBA	15	15	2.0	6.7	9.7
OXLI	XYBAPHUS LINEARIS	15	1	.1	.5	.6
PF	PERENNIAL FORB	15	1	.1	.5	.6
RUCR	RUMEX CRISPUS	15	1	.1	.5	.5
SAKA	SALSOLA KALI	15	15	2.0	3.3	9.7
SIAL	SISYMBRIUM ALTISSIMUM	15	4	.5	1.6	2.6
SHRAA	SMILACINA RACEMOSA	15	7	.9	2.3	4.5
SOLIO	SOLIDAGO SP.	15	3	.4	1.1	1.9

0 SUBTOTAL 15 154 20.5 9.1 100.0

SHRUB

AMUTU	AMELANCHIER UTAHENSIS	15	2	.3	.7	2.9
CHNAN	CHRYSOTHAMNUS NAUSEOSUS	15	6	.9	1.7	6.7
COSTS	CORNUS STOLONIFERA	15	4	.5	2.1	5.3
RHRA	RHUS RADICANS	15	1	.1	.5	1.4
RHTRT	RHUS TRILOBATA	15	21	2.9	4.9	30.4
RICEC	RIBES CEREUM	15	2	.3	1.0	2.9
ROSA	ROSA SP.	15	11	1.5	3.2	15.9
SALIX	SALIX SP.	15	22	2.9	6.1	31.9

0 SUBTOTAL 15 69 9.2 10.7 100.0

TREE

ACGLG	ACER GLABRUM	15	1	.1	.5	1.0
ACGR	ACER GRANDIDENTATUM	15	2	.3	1.0	2.1
POAN	POPULUS ANGUSTIFOLIA	15	64	8.5	12.0	66.7
QUGA	QUERCUS GAMBELII	15	27	3.6	4.0	28.1
ULPA	ULMUS PARVIFOLIA	15	2	.3	1.0	2.1

0 SUBTOTAL 15 96 12.8 13.4 100.0

TOTAL 15 423 56.4 11.3

BARE GROUND
LITTER-ROCK
VEGETATION, LITTER-ROCK

15 175 23.3 12.4
15 152 20.3 8.3
15 975 76.7 12.4

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VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
GRASS	AGRP	AGROPYRON SP.	15	5	33.3
	BRTET	BROMUS TECTORUM	15	13	86.7
	HQJWJ	HORDEUM JUBATUM	15	2	13.3
	ORHY	ORYZOPSIS HYMENOIDES	15	4	26.7
	PG	PERENNIAL GRASS	15	1	6.7
	POA	POA SP.	15	1	6.7
	STCO3	STIPA COMATA	15	3	20.0
SUBTOTAL			15	13	86.7
FORB	AF	ANNUAL FORB	15	4	26.7
	APANP	APOCYNUM ANDROSAEMIFOLIUM	15	4	26.7
	ASTER	ASTER SP.	15	6	40.0
	ASTRA	ASTRAGALUS SP.	15	1	6.7
	CHENO	CHENOPODIUM SP.	15	2	13.3
	CLL12	CLEMATIS LINGUSTICIFOLIA	15	11	73.3
	COAR2	CONYOLYULUS ARPENSIS	15	3	20.0
	DESCU	DESCURAINIA SP.	15	1	6.7
	GLLE	GLYCYRRHIZA LEPIDOTA	15	3	20.0
	GRSQ	GRINDELIA SQUARROSA	15	1	6.7
	IVAX	IVA AXILLARIS	15	4	26.7
	KOSC	KOCHIA SCOPARIA	15	1	6.7
	LAOC	LAPPULA OCCIDENTALIS	15	2	13.3
	MFAL	MELILOTUS ALBA	15	2	13.3
	DXLI	XYBAPHUS LINFARIS	15	1	6.7
	PF	PERENNIAL FORB	15	1	6.7
	RUCR	RUMEX CRISPUS	15	1	6.7
	SAKA	SALSOLA KALI	15	5	33.3
	SIAL	SISYMBRIUM ALTISSIMUM	15	2	13.3
	SMRAA	SMILACINA RACEMOSA	15	3	20.0
SOLID	SOLIDAGO SP.	15	2	13.3	
SUBTOTAL			15	15	100.0
SHRUB	AMUTU	AMELANCHIEP UTAHENSIS	15	2	13.3
	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	15	3	20.0
	COSTS	CORNUS STOLONIFERA	15	1	6.7
	RHRA	RHUS RADICANS	15	1	6.7
	RHRT	RHUS TRILOBATA	15	6	40.0
	RICEC	RIBES CEREBUM	15	1	6.7
	ROSA	ROSA SP.	15	4	26.7
SALIX	SALIX SP.	15	4	26.7	
SUBTOTAL			15	9	60.0

TR	ACGLG	ACER GLABRUM	15	1	6.7
	ACGR	ACER GRANDIDENTATUM	15	1	6.7
	POAN	POPULUS ANGUSTIFOLIA	15	7	46.7
	OUGA	QUERCUS GAMBELII	15	8	53.3
	ULPA	ULMUS PARVIFOLIA	15	1	6.7
SUBTOTAL			15	13	86.7
TOTAL			15	15	100.0

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 2.958
 VARIANCE - .022
 MAXIMUM INDEX - 3.714
 EVENNESS - .797
 NO OF SPECIES - 41

 **** EVALUATION OF SAMPLING ADEQUACY ****

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 15

MEAN VEGETATION PERCENT COVER = 56.4
 SAMPLE STANDARD DEVIATION = 11.3
 MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 13
 Z STATISTIC = 1.37
 CONFIDENCE LEVEL OBTAINED = 91.6 PERCENT

MEAN VEGETATION, LITTER-ROCK PERCENT COVER = 76.7
 SAMPLE STANDARD DEVIATION = 12.4
 MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 9
 Z STATISTIC = 1.69
 CONFIDENCE LEVEL OBTAINED = 95.5 PERCENT



VEGETATION COVER, FREQUENCY, AND SPECIES DIVERSITY ESTIMATES

PRIME RIVER COAL COMPANY
HELPER, UTAH

CRANDALL RIPARIAN
REFERENCE SITE
JULY 1981

TRANSECT 1

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PG	PERENNIAL GRASS	2	4.0	22.2
	POA	POA SP.	6	12.0	66.7
	STCO3	STIPA COMATA	1	2.0	11.1
	SUBTOTAL		9	18.0	100.0
FORB	PF	PERENNIAL FORB	1	2.0	100.0
			SUBTOTAL		1
TREE	PIPO	PINUS PONDEROSA	1	2.0	100.0
			SUBTOTAL		1
TOTAL			11	22.0	
BARE GROUND			12	24.0	
LITTER-ROCK			27	54.0	
VEGETATION, LITTER-ROCK			38	76.0	

TRANSECT 2

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	POA STCO3	POA SP. STIPA COMATA	5	10.0	71.4
			2	4.0	28.6
			SUBTOTAL		7
FORB	ASTER	ASTER SP.	1	2.0	100.0
			SUBTOTAL		1
SHRUB	HODU5	HOLDISCUS DUNDUS	1	2.0	100.0
			SUBTOTAL		1

TREE	CELEL	CERCOCARPUS LEDIFOLIUS	1	2.0	10.0
	PIPO	PINUS PONDEROSA	8	16.0	80.0
	POAN	POPULUS ANGUSTIFOLIA	1	2.0	10.0
SUBTOTAL			10	20.0	100.0

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TOTAL			19	38.0	
BARE GROUND			12	25.0	
LITTER-ROCK			19	38.0	
VEGETATION, LITTER-ROCK			38	76.0	

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PG	PERENNIAL GRASS	1	2.0	12.5
	POA	POA SP.	7	14.0	87.5
SUBTOTAL			8	16.0	100.0
FORB	ARLUL	ARTEMISIA LUDOVICIANA	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS	2	4.0	100.0
SUBTOTAL			2	4.0	100.0
TREE	POAN	POPULUS ANGUSTIFOLIA	4	8.0	100.0
SUBTOTAL			4	8.0	100.0
TOTAL			15	30.0	
BARE GROUND			18	36.0	
LITTER-ROCK			17	34.0	
VEGETATION, LITTER-ROCK			32	64.0	

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGRP	AGROPYRON SP.	1	2.0	10.0
	POA	PJA SP.	7	14.0	70.0
	STIPA	STIPA SP.	2	4.0	20.0
SUBTOTAL			10	20.0	100.0

	ACLAS	ACHILLEA LANULOSA	1	2.0	9.1
	ASTER	ASTER SP.	1	2.0	9.1
	CIRSI	CIRSIIUM SP.	1	2.0	9.1
	CYOF	CYNOGLOSSUM OFFICINALE	0	16.0	72.7
		SUBTOTAL	11	22.0	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS	2	4.0	100.0
		SUBTOTAL	2	4.0	100.0
TREE	PDAN	POPULUS ANGUSTIFOLIA	1	2.0	50.0
	PSHEM	PSEUDOTSUGA MENZIESII	1	2.0	50.0
		SUBTOTAL	2	4.0	100.0
		TOTAL	25	50.0	
		BARE GROUND	6	12.0	
		LITTER-ROCK	19	38.0	
		VEGETATION, LITTER-ROCK	44	88.0	

TRANSECT 5

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	7	14.0	87.5
	POA	POA SP.	1	2.0	12.5
		SUBTOTAL	8	16.0	100.0
FORB	ASTER	ASTER SP.	3	6.0	42.9
	CYOF	CYNOGLOSSUM OFFICINALE	3	6.0	42.9
	SIAL	SISYMBRIUM ALTISSIMUM	1	2.0	14.3
		SUBTOTAL	7	14.0	100.0
SHRUB	SALIX	SALIX SP.	1	2.0	100.0
		SUBTOTAL	1	2.0	100.0
		TOTAL	16	32.0	
		BARE GROUND	15	30.0	
		LITTER-ROCK	19	38.0	
		VEGETATION, LITTER-ROCK	35	70.0	

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BRUMUS TECTORUM	10	20.0	90.9
	POA	POA SP.	1	2.0	9.1
SUBTOTAL			11	22.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	20.0
	CYOF	CYNOGLOSSUM OFFICINALE	2	4.0	40.0
	DESCU	DESCURAINIA SP.	1	2.0	20.0
	PF	PERENNIAL FORB	1	2.0	20.0
SUBTOTAL			5	10.0	100.0
SHRUB	CHNAM	CHRYSOTHAMNUS NAUSEOSUS	1	2.0	50.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	50.0
SUBTOTAL			2	4.0	100.0
TREE	ACGR	ACER GRANDIDENTATUM	1	2.0	11.1
	POAN	POPULUS ANGUSTIFOLIA	8	16.0	88.9
SUBTOTAL			9	18.0	100.0
TOTAL			27	54.0	
BARE GROUND			12	24.0	
LITTER-ROCK			11	22.0	
VEGETATION, LITTER-ROCK			38	76.0	

254

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	1	2.0	5.0
	AGAL	AGROSTIS ALBA	1	2.0	5.0
	BRTET	BRUMUS TECTORUM	13	26.0	65.0
	POA	POA SP.	3	10.0	25.0
SUBTOTAL			20	40.0	100.0
GRASS-LIKE	JUNCU	JUNCUS SP.	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	16.7
	CYOF	CYNOGLOSSUM OFFICINALE	3	6.0	50.0
	CYFR	CYSTOPTERIS FRAGILIS	1	2.0	16.7
	SIAL	SISYMBRIUM ALTISSIMUM	1	2.0	16.7
SUBTOTAL			6	12.0	100.0
TREE	POAN	POPULUS ANGUSTIFOLIA	8	16.0	100.0

SUBTOTAL 8 16.0 100.0

TOTAL 35 79.0

BARE GROUND 6 12.0
 LITTER-ROCK 9 18.0
 VEGETATION, LITTER-ROCK 44 88.0

TRANSECT 8

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS	BRTET	BROMUS TECTORUM	9	18.0	81.8
	POA	POA SP.	2	4.0	18.2

SUBTOTAL 11 22.0 100.0

FORB	ASTER	ASTER SP.	2	4.0	13.3
	CYOF	CYNOGLOSSUM OFFICINALE	13	26.0	86.7

SUBTOTAL 15 30.0 100.0

TREE	JUOS	JUNIPERUS OSTEOSPERMA	1	2.0	9.1
	POAN	POPULUS ANGUSTIFOLIA	10	20.0	90.9

SUBTOTAL 11 22.0 100.0

TOTAL 37 74.0

BARE GROUND 1 2.0
 LITTER-ROCK 12 24.0
 VEGETATION, LITTER-ROCK 49 98.0

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM

GRASS	POA	POA SP.	5	10.0	83.3
	STIPA	STIPA SP.	1	2.0	16.7

SUBTOTAL 6 12.0 100.0

FORB	ASTER	ASTER SP.	2	4.0	25.0
	CIRSI	CIRSIUM SP.	1	2.0	12.5
	CYOF	CYNOGLOSSUM OFFICINALE	5	10.0	62.5

SUBTOTAL 8 16.0 100.0

255

SHRUB	SYDC	SYMPHORICARPOS OCCIDENTALIS		2	4.0	100.0
			SUBTOTAL	2	4.0	100.0
TREE	ACGR	ACER GRANDIDENTATUM		1	2.0	9.1
	JUDS	JUNIPERUS OSTEOSPERMA		2	4.0	18.2
	POAN	POPULUS ANGUSTIFOLIA		8	16.0	72.7
			SUBTOTAL	11	22.0	100.0
			TOTAL	27	54.0	
BARE GROUND				5	10.0	
LITTER-ROCK				18	36.0	
VEGETATION, LITTER-ROCK				42	90.0	

256

TRANSECT 10

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRIET	BROMUS TECTORUM	1	2.0	16.7
	POA	POA SP.	5	10.0	83.3
			SUBTOTAL	6	100.0
FORB	ANTEN	ANTENNARIA SP.	1	2.0	50.0
	CYOF	CYNOGLOSSUM OFFICINALE	1	2.0	50.0
			SUBTOTAL	2	100.0
SHRUB	ROSA	ROSA SP.	1	2.0	100.0
			SUBTOTAL	1	100.0
TREE	PIPD	PINUS PONDEROSA	7	14.0	53.8
	POAN	POPULUS ANGUSTIFOLIA	6	12.0	46.2
			SUBTOTAL	13	100.0
			TOTAL	22	44.0
BARE GROUND				9	18.0
LITTER-ROCK				19	38.0
VEGETATION, LITTER-ROCK				41	82.0

TRANSECT 11

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	STIPA	STIPA SP.	1	2.0	100.0
			SUBTOTAL	1	2.0
					100.0
FORB	ASTER	ASTER SP.	2	4.0	100.0
			SUBTOTAL	2	4.0
					100.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	3	6.0	20.0
	PIPO	PINUS PONDEROSA	5	10.0	33.3
	POAN	POPULUS ANGUSTIFOLIA	6	12.0	40.0
	QUGA	QUERCUS GAMBELII	1	2.0	6.7
			SUBTOTAL	15	30.0
					100.0
			TOTAL	18	36.0
BARE GROUND			8	16.0	
LITTER-ROCK			24	48.0	
VEGETATION, LITTER-ROCK			42	84.0	

TRANSECT 12

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PDA	PDA SP.	2	4.0	100.0
			SUBTOTAL	2	4.0
					100.0
SHRUB	RICEC	RIBES CEREUM	1	2.0	50.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	50.0
			SUBTOTAL	2	4.0
					100.0
TREE	ACGR	ACER GRANDIDENTATUM	3	6.0	14.3
	JUOS	JUNIPERUS OSTEOSPERMA	1	2.0	4.8
	POAN	POPULUS ANGUSTIFOLIA	11	22.0	52.4
	PSHEM	PSEUDOTSUGA MENZIESII	6	12.0	28.6
			SUBTOTAL	21	42.0
					100.0
			TOTAL	25	50.0
BARE GROUND			4	8.0	
LITTER-ROCK			21	42.0	
VEGETATION, LITTER-ROCK			46	92.0	

TRANSECT 13

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	1	2.0	33.3
	PG	PERENNIAL GRASS	1	2.0	33.3
	POA	POA SP.	1	2.0	33.3
SUBTOTAL			3	6.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	33.3
	CYOF	CYNOGLOSSUM OFFICINALE	2	4.0	66.7
SUBTOTAL			3	6.0	100.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	1	2.0	6.3
	POAN	POPULUS ANGUSTIFOLIA	13	26.0	91.3
	PSHEM	PSEUDOTSUGA MENZIESII	2	4.0	12.5
SUBTOTAL			16	32.0	100.0
TOTAL			22	44.0	
BARE GROUND			6	12.0	
LITTER-ROCK			22	44.0	
VEGETATION, LITTER-ROCK			44	88.0	

258

TRANSECT 14

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	POA	POA SP.	3	6.0	100.0
	SUBTOTAL			3	6.0
FORB	CYOF	CYNOGLOSSUM OFFICINALE	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TREE	ACGR	ACER GRANDIENTATUM	2	4.0	11.1
	POAN	POPULUS ANGUSTIFOLIA	9	18.0	50.0
	PSHEM	PSEUDOTSUGA MENZIESII	7	14.0	38.9
SUBTOTAL			18	36.0	100.0
TOTAL			22	44.0	
BARE GROUND			10	20.0	
LITTER-ROCK			18	36.0	
VEGETATION, LITTER-ROCK			40	80.0	

TRANSECT 15

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	POA	POA SP.	2	4.0	100.0
		SUBTOTAL	2	4.0	100.0
FORB	ASTER	ASTER SP.	2	4.0	100.0
		SUBTOTAL	2	4.0	100.0
TREE	ACGR	ACER GRANDIDENTATUM	1	2.0	4.5
	PIPO	PINUS PONDEROSA	7	14.0	31.8
	POAN	POPULUS ANGUSTIFOLIA	14	28.0	63.6
		SUBTOTAL	22	44.0	100.0
		TOTAL	26	52.0	
BARE GROUND			7	14.0	
LITTER-ROCK			17	34.0	
VEGETATION, LITTER-ROCK			43	86.0	

TRANSECT 16

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	BRTET	BROMUS TECTORUM	4	8.0	57.1
	POA	POA SP.	3	6.0	42.9
		SUBTOTAL	7	14.0	100.0
FORB	ASTER	ASTER SP.	5	10.0	83.3
	CYOF	CYNOGLOSSUM OFFICINALE	1	2.0	16.7
		SUBTOTAL	6	12.0	100.0
SHRUB	ROSA	ROSA SP.	1	2.0	20.0
	RUIDS	RUBUS IDAEUS	1	2.0	20.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	3	6.0	60.0
		SUBTOTAL	5	10.0	100.0
TREE	POAN	POPULUS ANGUSTIFOLIA	2	4.0	28.6
	PSHEM	PSEUDOTSUGA MENZIESII	5	10.0	71.4
		SUBTOTAL	7	14.0	100.0
		TOTAL	29	50.0	

BARE GROUND
LITTER-ROCK
VEGETATION, LITTER-ROCK

8
17
42

16.0
34.0
84.0

260

TRANSECT 17

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	POA	POA SP.	3	6.0	100.0
			SUBTOTAL		
FORB	ARLUL	ARTEMISIA LUDOVICIANA	1	2.0	50.0
	PDAV	POLYGONUM AVICULARE	1	2.0	50.0
SUBTOTAL			2	4.0	100.0
SHRUB	HDDU5	4DLIDISCUS DUMOSUS	1	2.0	50.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	50.0
SUBTOTAL			2	4.0	100.0
TREE	POAN	POPULUS ANGUSTIFOLIA	12	24.0	70.6
	OUGA	QUERCUS GAMBELII	5	10.0	29.4
SUBTOTAL			17	34.0	100.0
TOTAL			24	48.0	
BARE GROUND			10	20.0	
LITTER-ROCK			16	32.0	
VEGETATION, LITTER-ROCK			40	80.0	

TRANSECT 18

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
FORB	ANTEN	ANTENNARIA SP.	1	2.0	25.0
	ARLUL	ARTEMISIA LUDOVICIANA	1	2.0	25.0
	ASTER	ASTER SP.	1	2.0	25.0
	CYDF	CYNIGLOSSUM OFFICINALE	1	2.0	25.0
SUBTOTAL			4	8.0	100.0
SHRUB	RICEC	RIBES CERIFUM	2	4.0	66.7
	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	33.3
SUBTOTAL			3	6.0	100.0
TREE	JUDS	JUNIPERUS OSTEOSPERMA	1	2.0	5.0

PIPO	PINUS PONDEROSA	1	2.0	5.0
POAN	POPULUS ANGUSTIFOLIA	17	34.0	85.0
PSHEM	PSEUDOTSUGA MENZIESII	1	2.0	5.0
SUBTOTAL		20	40.0	100.0

TOTAL 27 54.0

BARE GROUND 10 20.0
 LITTER-ROCK 13 26.0
 VEGETATION, LITTER-ROCK 40 80.0

TRANSECT 19

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	POA	POA SP.	1	2.0	100.0
SUBTOTAL			1	2.0	100.0

FORB	ASTER	ASTER SP.	2	4.0	33.3
	CYOF	CYNIGLOSSUM OFFICINALE	2	4.0	33.3
	PENST	PENSTEMON SP.	1	2.0	16.7
	PF	PERENNIAL FORB	1	2.0	16.7
SUBTOTAL			6	12.0	100.0

SHRUB	ROSA	ROSA SP.	2	4.0	100.0
SUBTOTAL			2	4.0	100.0

TREE	ACGLG	ACER GLABRUM	1	2.0	5.3
	POAN	POPULUS ANGUSTIFOLIA	13	26.0	68.4
	PSHEM	PSEUDOTSUGA MENZIESII	5	10.0	26.3
SUBTOTAL			19	38.0	100.0

TOTAL 28 56.0

BARE GROUND 10 20.0
 LITTER-ROCK 12 24.0
 VEGETATION, LITTER-ROCK 40 80.0

TRANSECT 20

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGROP	AGROPYRON SP.	1	2.0	50.0
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261

GRASS	BRTET POA	3R0YUS TECTORUM POA SP.	12 4	24.0 8.0	75.0 25.0
		SUBTOTAL	16	32.0	100.0
FORB	ACLA5 ASTER CYOF	ACHILLEA LANULOSA ASTER SP. CYNIGLOSSUM OFFICINALE	1 3 11	2.0 6.0 22.0	6.7 20.0 73.3
		SUBTOTAL	15	30.0	100.0
		TOTAL	31	62.0	
BARE GROUND			9	18.0	
LITTER-ROCK			10	20.0	
VEGETATION, LITTER-ROCK			41	82.0	

TRANSECT 23

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	POA	POA SP.	5	10.0	100.0
		SUBTOTAL	5	10.0	100.0
FORB	ASTER CYOF SOLID	ASTER SP. CYNIGLOSSUM OFFICINALE SOLIDAGO SP.	1 4 2	2.0 8.0 4.0	14.3 57.1 28.6
		SUBTOTAL	7	14.0	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	100.0
		SUBTOTAL	1	2.0	100.0
TREE	PSHEM	PSEUDOTSUGA MENZIESII	3	6.0	100.0
		SUBTOTAL	3	6.0	100.0
		TOTAL	16	32.0	
BARE GROUND			14	28.0	
LITTER-ROCK			20	40.0	
VEGETATION, LITTER-ROCK			34	72.0	

TRANSECT 24

PERCENT COVER PERCENT COVER

ANTEN	ANTENNARIA SP.	24	2	.2	.6	1.7
ARLUL	ARTEMISTA LUDDVICIANA	24	3	.2	.7	2.6
ASTER	ASTER SP.	24	32	2.7	2.4	27.8
CIRSI	CIRSIIUM SP.	24	2	.2	.6	1.7
CYOF	CYNOGLOSSUM OFFICINALE	24	62	5.2	7.0	53.9
CYFR	CYSTOPTERIS FRAGILIS	24	1	.1	.4	.9
DESCU	DESCURAINIA SP.	24	1	.1	.4	.9
PENST	PENSTEMON SP.	24	1	.1	.4	.9
PF	PERENNIAL FORB	24	3	.2	.7	2.6
PDV	POLYGONUM AVICULARE	24	1	.1	.4	.9
SIAL	SISYMBRIUM ALTISSIMUM	24	2	.2	.6	1.7
SOLIO	SOLIDAGO SP.	24	3	.2	.9	2.6
SUBTOTAL		24	115	9.6	8.3	100.0

SHRUB	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	24	1	.1	.4	3.6
	HODUS	HOLIDISCUS DUMOSUS	24	2	.2	.6	7.1
	RICEC	RIBES CEREUM	24	3	.2	.9	10.7
	ROSA	ROSA SP.	24	4	.3	1.0	14.3
	RUIDS	RUBUS IDAEUS	24	1	.1	.4	3.6
	SALIX	SALIX SP.	24	1	.1	.4	3.6
	SYOC	SYMPHORICARPOS OCCIDENTALIS	24	16	1.3	1.9	57.1
SUBTOTAL		24	28	2.3	2.5	100.0	

TREE	ACGLG	ACER GLABRUM	24	2	.2	.6	.7
	ACGR	ACER GRANDIDENTATUM	24	8	.7	1.5	3.0
	CELEL	CERCOCARPUS LEDIFOLIUS	24	1	.1	.4	.4
	JUOS	JUNIPERUS OSTEOSPERMA	24	9	.7	1.5	3.3
	PIPO	PINUS PONDEROSA	24	39	3.2	6.3	14.4
	PDAN	POPULUS ANGUSTIFOLIA	24	168	14.0	10.5	62.2
	PSMEM	PSEUDOTSUGA MENZIESII	24	36	3.0	4.8	13.3
	QUGA	QUERCUS GAMBELII	24	7	.6	2.1	2.6
SUBTOTAL		24	270	22.5	13.9	100.0	

TOTAL		24	567	47.2	12.6	
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BARE GROUND	24	218	18.2	7.5
LITTER-ROCK	24	415	34.6	9.8
VEGETATION, LITTER-ROCK	24	982	81.8	7.5

VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
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265

GRASS	AGROP	AGROPYRON SP.	24	4	16.7
	AGAL	AGROSTIS ALBA	24	1	4.2
	BRTET	BROMUS TECTORUM	24	8	33.3
	PG	PERENNIAL GRASS	24	3	12.5
	PDA	PDA SP.	24	22	91.7
	STCO3	STIPA COMATA	24	2	8.3
	STIPA	STIPA SP.	24	3	12.5
		SUBTOTAL	24	23	95.8
GRASS-LIKE	JUNCU	JUNCUS SP.	24	1	4.2
		SUBTOTAL	24	1	4.2
FORB	ACLA9	ACHILLEA LANULOSA	24	2	8.3
	ANTEN	ANTENNARIA SP.	24	2	8.3
	ARLUL	ARTEMISIA LUDOVICIANA	24	3	12.5
	ASTER	ASTER SP.	24	19	75.0
	CIRSI	CIRSIIUM SP.	24	2	8.3
	CYOF	CYNODGLOSSUM OFFICINALE	24	17	70.8
	CYFR	CYSTOPTERIS FRAGILIS	24	1	4.2
	DESCU	DESCURAINIA SP.	24	1	4.2
	PENST	PENSTEMON SP.	24	1	4.2
	PF	PERENNIAL FORB	24	3	12.5
	PDAV	POLYGONUM AVICULARE	24	1	4.2
	SIAL	SISYMBRIUM ALTISSIMUM	24	2	8.3
	SOLID	SOLIDAGO SP.	24	2	8.3
		SUBTOTAL	24	23	95.8
SHRUB	CHNAN	CHRYSOTHAMNUS NAUSEOSUS	24	1	4.2
	HODU5	HOLIDISCUS DUMOSUS	24	2	8.3
	RICEC	RIBES CEREUM	24	2	8.3
	ROSA	ROSA SP.	24	3	12.5
	RUIDS	RUBUS IDAEUS	24	1	4.2
	SALIX	SALIX SP.	24	1	4.2
	SYJC	SYMPHORICARPOS OCCIDENTALIS	24	10	41.7
		SUBTOTAL	24	14	59.3
TREE	ACGL6	ACER GLARRUM	24	2	3.3
	ACGR	ACER GRANDIDENTATUM	24	5	20.8
	CELEL	CERCOCARPUS LEDIFOLIUS	24	1	4.2
	JUDS	JUNIPERUS OSTEOSPERMA	24	6	25.0
	PIPO	PINUS PONDEROSA	24	7	29.2
	POAN	POPULUS ANGUSTIFOLIA	24	20	63.3
	PSMEM	PSEUDOTSUGA MENZIESII	24	9	37.5
	QUGA	QUERCUS GAMBELII	24	3	12.5
		SUBTOTAL	24	22	91.7
		TOTAL	24	24	100.0

266

DIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 2.424
VARIANCE - .033
MAXIMUM INDEX - 3.584
EVENNESS - .676
NO OF SPECIES - 36

**** EVALUATION OF SAMPLING ADEQUACY ****

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 24

MEAN VEGETATION PERCENT COVER = 47.2
SAMPLE STANDARD DEVIATION = 12.6
MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 23
Z STATISTIC = 1.30
CONFIDENCE LEVEL OBTAINED = 90.3 PERCENT

MEAN VEGETATION, LITTER-ROCK PERCENT COVER = 81.8
SAMPLE STANDARD DEVIATION = 7.5
MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 3
Z STATISTIC = 3.80
CONFIDENCE LEVEL OBTAINED = 100.0 PERCENT

SUBTOTAL 3 6.0 100.0

TREE	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
	ARLA	ABIES LASIOCARPA	3	6.0	17.6
	JUCS	JUNIPERUS OSTEOSPERMA	4	8.0	23.5
	PIPO	PINUS PONDEROSA	1	2.0	5.9
	PSPFM	PSEUDOTSUGA MENZIESII	6	12.0	35.3
	OUGA	QUERCUS GAMBELII	3	6.0	17.6

SUBTOTAL 17 34.0 100.0

TOTAL 31 62.0

BARE GROUND	0	.0
LITTER-ROCK	19	38.0
VEGETATION, LITTER-ROCK	50	100.0

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGROP	AGROPYRON SP.	6	12.0	100.0
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SUBTOTAL 6 12.0 100.0

TREE	ABLA	ABIES LASIOCARPA	2	4.0	6.7
	JUCS	JUNIPERUS OSTEOSPERMA	6	12.0	20.0
	PSPFM	PSEUDOTSUGA MENZIESII	20	40.0	66.7
	OUGA	QUERCUS GAMBELII	2	4.0	6.7

SUBTOTAL 30 60.0 100.0

TOTAL 36 72.0

BARE GROUND	0	.0
LITTER-ROCK	14	28.0
VEGETATION, LITTER-ROCK	50	100.0

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGROP	AGROPYRON SP.	11	22.0	100.0
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SUBTOTAL 11 22.0 100.0

TREE	ARLA	ABIES LASIOCARPA	4	8.0	16.0
	CELE	CERCOCARPUS LEDIFOLIUS	5	10.0	20.0

	JUCS	JUNIPERUS OSTEDSPERMA	8	16.0	32.0
	PIED	PINUS EDULIS	1	2.0	4.0
	PSPEM	PSEUDOTSUGA MENZIESII	4	8.0	16.0
	OUCA	QUERCUS GAMBELII	3	6.0	12.0
					270
		SUBTOTAL	25	50.0	100.0
		TOTAL	36	72.0	
		BARE GROUND	6	12.0	
		LITTER-ROCK	8	16.0	
		VEGETATION, LITTER-ROCK	44	88.0	

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	8	16.0	88.9
	POA	POA SP.	1	2.0	11.1
		SUBTOTAL	9	18.0	100.0
FORB	SEPU2	SENECTO MULTICRATUS	2	4.0	100.0
		SUBTOTAL	2	4.0	100.0
TREE	JUCS	JUNIPERUS OSTEDSPERMA	4	8.0	16.0
	PSPEM	PSEUDOTSUGA MENZIESII	1	2.0	4.0
	OUCA	QUERCUS GAMBELII	20	40.0	80.0
		SUBTOTAL	25	50.0	100.0
		TOTAL	36	72.0	
		BARE GROUND	0	.0	
		LITTER-ROCK	14	28.0	
		VEGETATION, LITTER-ROCK	50	100.0	

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	5	10.0	55.6
	OPHY	ORYZOPSIS HYPENOIDES	2	4.0	22.2
	PG	PERENNIAL GRASS	2	4.0	22.2
		SUBTOTAL	9	18.0	100.0

FORB

AF

ANNUAL FORB

1

2.0

100.0

SUBTOTAL

1

2.0

100.0

TREE

JUCS

JUNIPERUS OSTEOSPERMA

4

8.0

16.0

PIED

PINUS EDULIS

4

8.0

16.0

PSPHM

PSEUDOTSUGA MENZIESII

6

12.0

24.0

OUGA

QUERCUS GAMBELII

11

22.0

44.0

SUBTOTAL

25

50.0

100.0

TOTAL

35

70.0

BARE GROUND

1

2.0

LITTER-ROCK

14

28.0

VEGETATION, LITTER-ROCK

49

98.0

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	2	4.0	33.3
	ORHY	ORYZOPSIS HYMENOIDES	1	2.0	16.7
	PG	PERENNIAL GRASS	3	6.0	50.0
SUBTOTAL			6	12.0	100.0

TREE	CELEL	CERCOCARPUS LEDIFOLIUS	2	4.0	6.9
	JUCS	JUNIPERUS OSTEOSPERMA	7	14.0	24.1
	PIED	PINUS EDULIS	1	2.0	3.4
	PSPHM	PSEUDOTSUGA MENZIESII	12	24.0	41.4
	OUGA	QUERCUS GAMBELII	7	14.0	24.1
SUBTOTAL			29	58.0	100.0

TOTAL 35 70.0

BARE GROUND

3

6.0

LITTER-ROCK

12

24.0

VEGETATION, LITTER-ROCK

47

94.0

TRANSECT 8

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	4	8.0	80.0
	ORHY	ORYZOPSIS HYMENOIDES	1	2.0	20.0

			SUBTOTAL	5	10.0	100.0
FORB	SEMU2	SENECIO MULTILOBATUS		1	2.0	100.0
			SUBTOTAL	1	2.0	100.0
SHRUB	BERE	BERRERIS REPENS		5	10.0	83.3
	SYCC	SYMPHORICARPOS OCCIDENTALIS		1	2.0	16.7
			SUBTOTAL	6	12.0	100.0
TREE	ABLA	ABIES LASIOCARPA		7	14.0	36.8
	CELEL	CERCOCARPUS LEDIFOLIUS		2	4.0	10.5
	JUCS	JUNIPERUS OSTEOSPERMA		7	14.0	36.8
	PSPEM	PSEUDOTSUGA MENZIESII		3	6.0	15.8
			SUBTOTAL	19	38.0	100.0
			TOTAL	31	62.0	
BARE GROUND				3	6.0	
LITTER-ROCK				16	32.0	
VEGETATION, LITTER-ROCK				47	94.0	

272

TRANSECT 9

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	4	6.0	60.0
	PG	PERENNIAL GRASS	1	2.0	20.0
			SUBTOTAL	5	100.0
TREE	ABLA	ABIES LASIOCARPA	16	32.0	53.3
	JUCS	JUNIPERUS OSTEOSPERMA	5	10.0	16.7
	PSPEM	PSEUDOTSUGA MENZIESII	5	10.0	16.7
	OUGA	QUERCUS GAMBELII	4	8.0	13.2
			SUBTOTAL	30	100.0
			TOTAL	35	70.0
BARE GROUND				1	2.0
LITTER-ROCK				14	28.0
VEGETATION, LITTER-ROCK				40	98.0

TRANSECT 10

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGROP	AGROPYRON SP.	15	30.0	100.0
SUBTOTAL			15	30.0	100.0
TREE	ABCO	ABIES CONCOLOR	2	4.0	11.8
	CFLEL	CERCOCARPUS LEDIFOLIUS	3	6.0	17.6
	JUDS	JUNIPERUS OSTEOSPERMA	5	10.0	29.4
	PIED	PINUS EDULIS	2	4.0	11.8
	PSPHM	PSEUDOTSUGA MENZIESII	2	4.0	11.8
	QUEA	QUERCUS GAMBELII	3	6.0	17.6
SUBTOTAL			17	34.0	100.0
TOTAL			32	64.0	
BARE GROUND			1	2.0	
LITTER-ROCK			17	34.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 11

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	2	4.0	22.2
	AGROP	AGROPYRON SP.	7	14.0	77.8
SUBTOTAL			9	18.0	100.0
FORB	ANTEN	ANTENNARIA SP.	1	2.0	20.0
	PF	PERENNIAL FORB	4	8.0	80.0
SUBTOTAL			5	10.0	100.0
SHRUB	CEPDM	CERCOCARPUS MONTANUS	4	8.0	66.7
	PIRES	PIRES SP.	2	4.0	33.3
SUBTOTAL			6	12.0	100.0
TREE	ACCR	ACER GRANDIDENTATUM	2	4.0	9.5
	CELEL	CERCOCARPUS LEDIFOLIUS	4	8.0	19.0
	JUDS	JUNIPERUS OSTEOSPERMA	8	16.0	38.1
	PIED	PINUS EDULIS	7	14.0	33.3
SUBTOTAL			21	42.0	100.0
BRYOPHYTE	MOSS	BRYOPHYTE	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
TOTAL			42	84.0	
BARE GROUND			1	2.0	

LITTER-ROCK
VEGETATION, LITTER-ROCK7
49 14.0
98.0

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TRANSECT 12

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	11	22.0	73.3
	ORHY	DRYZOPSIS HYMENOIDES	1	2.0	6.7
	PG	PERENNIAL GRASS	3	6.0	20.0
SUBTOTAL			15	30.0	100.0
FORB	AF	ANNUAL FORB	1	2.0	100.0
			SUBTOTAL		
TREE	APLA	ABIES LASIOCARPA	5	10.0	29.4
	CELEL	CEROCARPUS LEDIFOLIUS	1	2.0	5.9
	JUOS	JUNIPERUS OSTEOSPERMA	1	2.0	5.9
	PIED	PINUS EDLIS	6	12.0	35.3
	PSMEM	PSEUDOTSUGA MENZIESII	4	8.0	23.5
SUBTOTAL			17	34.0	100.0
BRYOPHYTE	MOSS	BRYOPHYTE	4	8.0	100.0
			SUBTOTAL		
TOTAL			37	74.0	
BARE GROUND			0	.0	
LITTER-ROCK			13	26.0	
VEGETATION, LITTER-ROCK			50	100.0	

TRANSECT 13

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	26	52.0	100.0
			SUBTOTAL		
FORB	ANTEN	ANTENNARIA SP.	1	2.0	100.0
			SUBTOTAL		
SUR-SHRUB	XASA	YANTHOCEPHALUM SAROTHPAE	1	2.0	100.0
			SUBTOTAL		

TREE	JUGS	JUNIPERUS OSTEOSPERMA	7	14.0	58.3
	PIED	PINUS EDULIS	5	10.0	41.7
SUBTOTAL			12	24.0	100.0
TOTAL			40	60.0	
BARE GROUND			1	2.0	
LITTER-ROCK			9	16.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 14

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	AGPOP	AGROPYRON SP.	15	30.0	100.0
SUBTOTAL			15	30.0	100.0
FORB	ANTEN	ANTENNARIA SP.	2	4.0	100.0
SUBTOTAL			2	4.0	100.0
SHRUB	CEPOM	CERCOCARPUS MONTANUS	3	6.0	75.0
	RIPES	RIPES SP.	1	2.0	25.0
SUBTOTAL			4	6.0	100.0
TREE	ABCO	ABIES CONCOLOR	1	2.0	6.3
	ABLA	ABIES LASIOCARPA	1	2.0	6.3
	JUGS	JUNIPERUS OSTEOSPERMA	13	26.0	81.3
	PSPEM	PSEUDOTSUGA MENZIESII	1	2.0	6.3
SUBTOTAL			16	32.0	100.0
BRYOPHYTE	MOSS	BRYOPHYTE	5	10.0	100.0
SUBTOTAL			5	10.0	100.0
TOTAL			42	64.0	
BARE GROUND			1	2.0	
LITTER-ROCK			7	14.0	
VEGETATION, LITTER-ROCK			49	98.0	

TRANSECT 15

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
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GRASS	AGINI	AGROPYRON INTERMEDIUM	1	2.0	6.3
	AGROP	AGROPYRON SP.	19	26.0	81.3
	PG	PERENNIAL GRASS	2	4.0	12.5
SUBTOTAL			16	32.0	100.0
SHRUB	CEPOM	CEPCOCAPPUS MONTANUS	3	6.0	42.9
	RIBES	RIBES SP.	4	8.0	57.1
	SUBTOTAL			7	14.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	5	10.0	26.3
	PSMEM	PSEUDOTSUGA MENZIESII	14	28.0	73.7
	SUBTOTAL			19	38.0
TOTAL			42	84.0	
BARE GROUND LITTER-ROCK VEGETATION, LITTER-ROCK			2	4.0	
			6	12.0	
			48	96.0	

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SUMMARY - ALL COVER TRANSECTS

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	N	# OF HITS	PERCENT COVER ALL CLASSES		PERCENT COVER
					MEAN	S.D.	WITHIN LIFE FORM
GRASS	AGINI	AGROPYRON INTERMEDIUM	15	3	.4	1.1	1.5
	AGROP	AGROPYRON SP.	15	142	18.9	12.2	87.1
	ORLY	ORYZOPSIS HYMENOIDES	15	6	.8	1.3	3.7
	PG	PERENNIAL GRASS	15	11	1.5	2.3	6.7
	PDA	PDA SP.	15	1	.1	.5	.6
	SUBTOTAL			15	163	21.7	11.4
0 FORB	AF	ANNUAL FORB	15	3	.4	.8	21.4
	ANTEN	ANTENNARIA SP.	15	4	.5	1.2	20.6
	PF	PERENNIAL FORB	15	4	.5	2.1	26.6
	SEMU?	SENECIO MULTILOBATUS	15	3	.4	1.1	21.4
	SUBTOTAL			15	14	1.9	2.7
0 SUB-SHRUB	XASA	XANTHOCEPHALUM SAROTHRAE	15	1	.1	.5	100.0
SUBTOTAL			15	1	.1	.5	100.0

SHRUB		BERE	BERBERIS REPENS	15	5	.7	2.6	16.7
		CEMOM	CERCOCARPUS MONTANUS	15	10	1.3	2.8	33.3
		RIBES	RIBES SP.	15	7	.9	2.3	23.3
		SYOC	SYMPHORICARPOS OCCIDENTALIS	15	8	1.1	2.5	26.7
				SUBTOTAL		15	30	4.0 5.4 100.0
0								
TREE		ABCO	ABIES CONCOLOR	15	3	.4	1.1	.9
		ARLA	ABIES LASIOCARPA	15	40	5.3	8.6	12.2
		ACGR	ACER GRANDIDENTATUM	15	2	.3	1.0	.6
		CELEL	CERCOCARPUS LEDIFOLIUS	15	18	2.4	3.3	5.5
		JUDS	JUNIPERUS OSTEOSPERMA	15	86	11.5	5.7	26.1
		PIED	PINUS EDULIS	15	27	3.6	4.9	6.2
		PIPD	PINUS PONDEPOSA	15	1	.1	.5	.3
		PSPEK	PSEUDOTSUGA PENZIESII	15	81	10.8	11.4	24.6
		QUCA	QUERCUS GAMBELII	15	71	9.5	13.1	21.5
				SUBTOTAL		15	329	43.9 11.2 100.0
0								
BRYOPHYTE		MOSS	BRYOPHYTE	15	10	1.3	3.2	100.0
				SUBTOTAL		15	10	1.3 3.2 100.0
0								
				TOTAL		15	547	72.9 7.4
BARE GROUND				15	21	2.8	3.2	
LITTER-ROCK				15	182	24.3	7.9	
VEGETATION, LITTER-ROCK				15	729	97.2	3.2	

VEGETATION SPECIES FREQUENCY

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	TOTAL NUMBER OF TRANSECTS	NUMBER OF TRANSECTS CONTAINING SPECIES	PERCENT FREQUENCY
GRASS	AGINI	ACROPYRON INTERMEDIUM	15	2	13.3
	AGPDP	ACROPYRON SP.	15	15	100.0
	DRHY	ORYZOPSIS HYPENOIDES	15	1	33.3
	PG	PERENNIAL GRASS	15	5	33.3
	PDA	PDA SP.	15	1	6.7
			SUBTOTAL		15 15 100.0
FORB	AF	ANNUAL FORB	15	3	20.0
	ANTEN	ANTENNARIA SP.	15	3	20.0
	PF	PERENNIAL FORB	15	1	6.7

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SEPU2 SENEIO MULTILOBATUS			15	2	13.3
			-----	-----	-----
SUBTOTAL			15	8	53.3
SUB-SHRUB	XASA	XANTHOCEPHALUM SAROTHRAE	15	1	6.7
			-----	-----	-----
SUBTOTAL			15	1	6.7
SHRUB	BEFE	BEBBERIS REPENS	15	1	6.7
	CEMOM	CERCOCARPUS MONTANUS	15	3	20.0
	RIBES	RIPES SP.	15	3	20.0
	SYCC	SYMPHORICARPOS OCCIDENTALIS	15	3	20.0
			-----	-----	-----
SUBTOTAL			15	6	40.0
TREE	ABCO	ABIES CONCOLOR	15	2	13.3
	ARLA	ABIES LASIOCARPA	15	8	53.3
	ACER	ACER GRANDIDENTATUM	15	1	6.7
	CELEL	CERCOCARPUS LEDIFOLIUS	15	7	46.7
	JUCS	JUNIPERUS OSTEOSPERMA	15	15	100.0
	PIED	PINUS EDULIS	15	8	53.3
	PIPO	PINUS PONDEROSA	15	1	6.7
	PSHEM	PSEUDOTSUGA MENZIESII	15	13	86.7
	OUCA	QUERCUS GAMBELII	15	9	60.0
			-----	-----	-----
SUBTOTAL			15	15	100.0
BRYOPHYTE	MOSS	BRYOPHYTE	15	3	20.0
			-----	-----	-----
SUBTOTAL			15	3	20.0
			-----	-----	-----
TOTAL			15	15	100.0

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DIIVERSITY INDEX CALCULATIONS

SHANNON INDEX - 2.317
 VARIANCE - .038
 MAXIMUM INDEX - 3.178
 EVENNESS - .729
 NO OF SPECIES - 24

 *** EVALUATION OF SAMPLING ADEQUACY ***

DESIRED CONFIDENCE LEVEL = 90.0 PERCENT

SAMPLE SIZE = 15

MEAN VEGETATION PERCENT COVER = 72.9
SAMPLE STANDARD DEVIATION = 7.4
MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 3
Z STATISTIC = 2.70
CONFIDENCE LEVEL OBTAINED = 99.7 PERCENT

MEAN VEGETATION, LITTER-ROCK PERCENT COVER = 97.2
SAMPLE STANDARD DEVIATION = 3.2
MINIMUM SAMPLE SIZE TO PROVIDE DESIRED CONFIDENCE LEVEL = 0
Z STATISTIC = 9.35
CONFIDENCE LEVEL OBTAINED = 100.0 PERCENT

PRICE RIVER COAL COMPANY
HELPER, UTAH

CRANDALL CONIFER
REFERENCE SITE
JULY 1981

TRANSECT 1

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
FORB	CERAS	CERASTIUM SP.	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
SHRUB	BERE	BERBERIS REPENS	2	4.0	100.0
SUBTOTAL			2	4.0	100.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	2	1.0	6.1
	PIPO	PINUS PONDEROSA	7	14.0	21.2
	PSMEH	PSEUDOTSUGA MENZIESII	23	46.0	69.7
	OUGA	QUERCUS GAMBELII	1	2.0	3.0
SUBTOTAL			33	66.0	100.0
TOTAL			36	72.0	
BARE GROUND			0	.0	
LITTER-ROCK			14	28.0	
VEGETATION, LITTER-ROCK			50	100.0	

TRANSECT 2

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PG	PERENNIAL GRASS	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
SHRUB	BERE	BERBERIS REPENS	2	4.0	100.0
SUBTOTAL			2	4.0	100.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	5	10.0	12.8
	PSMEH	PSEUDOTSUGA MENZIESII	33	66.0	84.6
	OUGA	QUERCUS GAMBELII	1	2.0	2.6

SUBTOTAL 39 78.0 100.0

TOTAL 42 84.0

BARE GROUND 2 4.0
 LITTER-ROCK 6 12.0
 VEGETATION, LITTER-ROCK 48 96.0

TRANSECT 3

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM
GRASS	AGROP	AGROPYRON SP.	1	2.0	100.0
SUBTOTAL			1	2.0	100.0
FORB	ACLAS	ACHILLEA LANULOSA	1	2.0	25.0
	ARLUL	ARTEMISIA LUDOVICIANA	1	2.0	25.0
	CERAS	CERASTIUM SP.	1	2.0	25.0
	VIAMM	VICIA AMERICANA	1	2.0	25.0
SUBTOTAL			4	8.0	100.0
SHRUB	BERE	BERBERIS REPENS	1	2.0	25.0
	SYOC	SYMPHORICARPOS OCCIDENTALIS	3	6.0	75.0
SUBTOTAL			4	8.0	100.0
TREE	PIPO	PINUS PONDEROSA	3	6.0	11.5
	PSHEM	PSEUDOTSUGA MENZIESII	23	46.0	89.5
SUBTOTAL			26	52.0	100.0
TOTAL			35	70.0	

BARE GROUND 0 0
 LITTER-ROCK 15 30.0
 VEGETATION, LITTER-ROCK 50 100.0

TRANSECT 4

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	
				ALL CLASSES	WITHIN LIFE FORM
FORB	ACLAS	ACHILLEA LANULOSA	2	4.0	40.0
	PF	PERENNIAL FORB	1	2.0	20.0
	POTEN	POTENTILLA SP.	1	2.0	20.0
	TAOF	TARAXACUM OFFICINALE	1	2.0	20.0

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			SUBTOTAL	5	10.0	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS		7	14.0	100.0
			SUBTOTAL	7	14.0	100.0
TREE	PIPO	PINUS PONDEROSA		7	14.0	29.2
	PSMEH	PSEUDOTSUGA MENZIESII		17	34.0	70.8
			SUBTOTAL	24	48.0	100.0
			TOTAL	36	72.0	
BARE GROUND				6	12.0	
LITTER-ROCK				8	16.0	
VEGETATION, LITTER-ROCK				44	88.0	

TRANSECT 5

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PG	PERENNIAL GRASS	2	4.0	100.0
			SUBTOTAL	2	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	100.0
			SUBTOTAL	1	100.0
TREE	PIPO	PINUS PONDEROSA	17	34.0	44.7
	PSMEH	PSEUDOTSUGA MENZIESII	21	42.0	55.3
			SUBTOTAL	38	100.0
			TOTAL	41	82.0
BARE GROUND				0	0.0
LITTER-ROCK				5	18.0
VEGETATION, LITTER-ROCK				50	100.0

TRANSECT 6

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER ALL CLASSES	PERCENT COVER WITHIN LIFE FORM
GRASS	PG	PERENNIAL GRASS	3	6.0	75.0
	POA	POA SP.	1	2.0	25.0
			SUBTOTAL	4	100.0

FORB	ARLUL	ARTENISIA LUDDVICIANA	2	4.0	66.7
	ASTER	ASTER SP.	1	2.0	33.3
SUBTOTAL			3	6.0	100.0
SHRUB	SYOC	SYMPHORICARPOS OCCIDENTALIS	1	2.0	100.0
	SUBTOTAL			1	2.0
TREE	JUOS	JUNIPERUS OSTEOSPERMA	1	2.0	4.2
	PIPO	PINUS PONDEPOSA	6	16.0	33.3
	PSMEH	PSEUDOTSUGA MENZIESII	14	28.0	58.3
	OUGA	QUERCUS GAMBELII	1	2.0	4.2
SUBTOTAL			24	48.0	100.0
TOTAL			32	64.0	

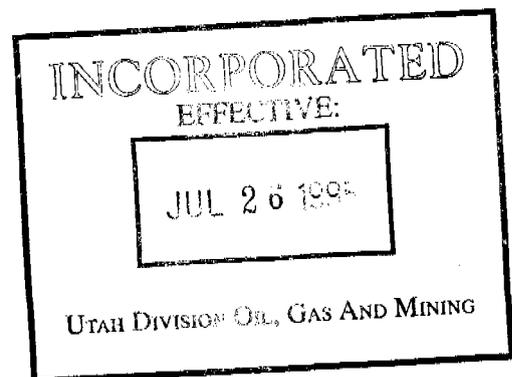
BARE GROUND			5	10.0	
LITTER-ROCK			13	26.0	
VEGETATION, LITTER-ROCK			45	90.0	

TRANSECT 7

LIFE FORM	SPECIES CODE	SCIENTIFIC NAME	# OF HITS	PERCENT COVER	PERCENT COVER
				ALL CLASSES	WITHIN LIFE FORM
GRASS	BPMU	BROMUS SP.	1	2.0	20.0
	PG	PERENNIAL GRASS	2	4.0	40.0
	POA	POA SP.	2	4.0	40.0
SUBTOTAL			5	10.0	100.0
FORB	ASTER	ASTER SP.	1	2.0	50.0
	FRVI	FRAGARIA VIRGINIANA	1	2.0	50.0
SUBTOTAL			2	4.0	100.0
SHRUB	BUIDS	BURJS IDAEUS	1	2.0	11.1
	SYOC	SYMPHORICARPOS OCCIDENTALIS	8	16.0	88.9
SUBTOTAL			9	18.0	100.0
TREE	PIPO	PINUS PONDEROSA	6	16.0	61.5
	PSMEH	PSEUDOTSUGA MENZIESII	4	8.0	30.8
	OUGA	QUERCUS GAMBELII	1	2.0	7.7
SUBTOTAL			13	26.0	100.0
TOTAL			29	58.0	
BARE GROUND			1	2.0	
LITTER-ROCK			20	40.0	
VEGETATION, LITTER-ROCK			49	98.0	

**CHAPTER 10
FISH AND WILDLIFE**

**CASTLE GATE MINE
AMAX COAL COMPANY
Carbon County, Utah**



April 1995

CHAPTER 10

FISH AND WILDLIFE RESOURCES INFORMATION AND PROTECTION PLANS

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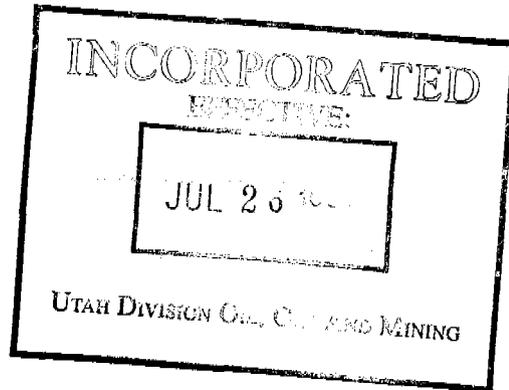
INCORPORATED
EFFECTIVE:
JUL 26 1995
OIL, GAS AND MINING

LIST OF APPENDICES

- APPENDIX 10-A SPECIES LIST OF VERTEBRATE WILDLIFE
- APPENDIX 10-B RECOMMENDED PLANT MATERIALS FOR RESTORATION OR ENHANCEMENT OF WILDLIFE HABITATS
- APPENDIX 10-C JANET LEE YOUNG, PHD RAPTOR SURVEY
- APPENDIX 10-D SURVEY FOR MIGRATORY BIRDS AND THEIR HIGH PRIORITY HABITATS HAVING HIGH FEDERAL INTEREST
- APPENDIX 10-E MIGRATION AND IMPACT AVOIDANCE PROCEDURES

LIST OF EXHIBITS

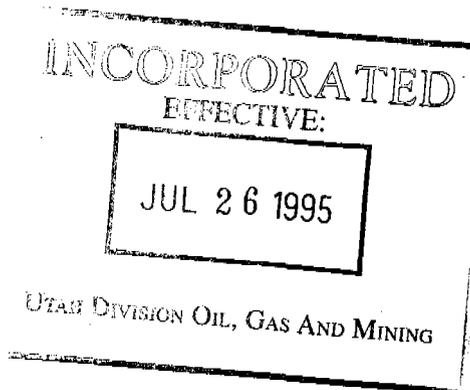
- EXHIBIT 10-1 WILDLIFE HABITAT INVENTORY MS



10.0

INTRODUCTION

In early 1979, information on fish and wildlife within the Mine Plan Area was requested from the Utah Division of Fish and Wildlife Resources. Mr. Larry Dalton of the Division, performed a field reconnaissance in the Spring of 1979. A site specific base line inventory and a wildlife management plan was prepared. A full package is included as Sections 10.1-1 and 10.1-2 of this chapter as the general wildlife resources information required by UMC 783.20, 784.21 and as a basis for compliance to the performance standards in UMC 817.97. Site specific raptor information for our only current, new development; Crandall Canyon shaft facilities, is included in appendices to this chapter. Section 10.2 is the protection plan for fish and wildlife resources.



FISH AND WILDLIFE RESOURCE INFORMATION

UMC 783.20; FISH AND WILDLIFE RESOURCE INFORMATION

PRICE RIVER COAL COMPANY, BRAZTAH COMPLEX MINING PROJECT

Complex purchased from Price River Coal Company

by Castle Gate Coal Company in 1986

General Wildlife Resource Information—All Species of Vertebrate Wildlife

INCORPORATED

RESERVE

JUL 26 1995

UTAH DIVISION OF OIL, GAS AND MINING

The mine plan area encompasses a portion of the West Tavaputs and Wasatch Plateaus in Carbon County, Utah. This area drains directly into the Price River or its tributaries and then flows into the Green River and ultimately into the Colorado River at a point upstream from Lake Powell. Generally speaking, the West Tavaputs and Wasatch Plateaus are encompassed by cold desert (upper Sonoran life zone), submontane (Transition life zone) and montane (Canadian and Hudsonian life zones) ecological associations. These life zones could be inhabited on occasion and during different seasons of the year by about 386 species of vertebrate wildlife—25 fish species, 6 amphibian species, 19 reptile species, 249 bird species and 88 mammal species. It is interesting to note that 84 percent of these species are protected.

The mine plan area itself is represented by the Transition and Canadian life zones and provides habitat for approximately 200 species of wildlife—7 fish species, 6 amphibian species, 17 reptile species, 152 bird species and 79 mammal species. Seventy-one of these species are of high interest to the State of Utah.

The Division Publication No. 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" is appended (Appendix A) to this report since it represents a low level of study for the wildlife species listed. It identifies those species having potential to inhabit the region as well as those inhabiting the environs of the mine plan area. Appendix A also identifies which species are considered to be of a high interest for the habitats and local area represented.

High interest wildlife are defined as all game species; any economically important species; and any species of special aesthetic, scientific or educational significance. This definition would include all federally listed, threatened and endangered species of wildlife.

A ranking and display of wildlife habitats and use areas relative to high interest species of vertebrate wildlife has been developed (Appendix 10A and the wildlife maps). Critical wildlife use areas followed in respective importance by high-priority, substantial value and limited value wildlife use areas require various levels of protection from man's activities and developments.

Critical wildlife use areas are "sensitive use areas" necessary to sustain the existence and perpetuation of one or more species of wildlife during crucial periods of their life cycles. These areas are restricted in area and lie within high-priority wildlife use areas. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 1 or 2 are classified as being critical. Biological intricacies dictate that significant disturbances cannot be tolerated by the members of an ecological assemblage on critical sites. Professional opinion is that disturbances to critical use areas or habitats will result in irreversible changes in species composition and/or biological productivity of an area.

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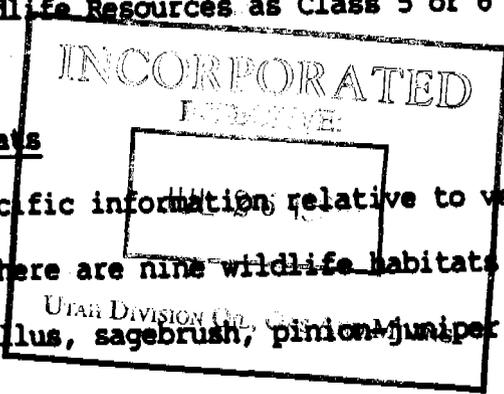
High-priority wildlife use areas are "intensive use areas" for one or more species of wildlife. "Intensive use areas" are not restricted in area and in conjunction with limited value use areas from the substantial value distribution for a wildlife species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 3 are classified as being of high-priority. In addition, wildlife use areas where surface disturbance or underground activities may result in subsidence that could interrupt underground aquifers and result in a potential for loss of ground water and decreased flows in seeps and springs should be considered as being of high-priority to wildlife.

Substantial value wildlife use areas are "existence areas" for one or more species of wildlife. "Existence areas" represent a herd or population distribution and are formed by the merging of high-priority and limited value wildlife use areas for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 4 are classified of being of substantial value.

Limited value wildlife use areas are "occasional use areas" for one or more species of wildlife. "Occasional use areas" are part of the substantial value wildlife use area for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 5 or 6 are classified as being of limited value.

Vegetation, Wildlife Use Areas and Habitats

The Division does not have site specific information relative to vegetation types at the mine plan area. However, there are nine wildlife habitats present—riparian or wetland types, cliffs and talus, sagebrush, pinion-juniper forest,



shrubland, aspen forest, ponderosa forest, parkland and spruce-fir forest. The relative value to wildlife for each of these habitats has been ranked and is presented in Tables 1 and 2, in Appendix 10A.

It is believed that if satisfactory reclamation is achieved and man's disturbance does not continue or become a factor, that most species of wildlife displaced from the mine plan area will return. Without doubt, the key to success for enhancing or restoring wildlands will be development of habitats so that the postmining condition as compared to the premining condition will have similar species, frequency and distribution of permanent plants in each vegetative type. This will allow for natural plant succession. Additionally, other habitat features that represent the various life requirements for local wildlife must be provided.

FISH AND WILDLIFE INVENTORY

Aquatic Use Areas

Macrophytes

From a position of the aquatic wildlife resource it is believed that there is no practicality for information relative to macrophytes to be addressed by the mine permit application; such information is not generally available.

Macroinvertebrates

The results from studies of macroinvertebrates may be required for purposes of determining need for stream buffer zones (UMC 817.57) in stream sections supporting biological communities. Since the permit application does not identify any plans to impact the local salmonid fishery or discharge of polluting effluents into local waters, no data relative to macroinvertebrates as a

pollution index or a forage base for fishes or other predators dependent upon the aquatic resources need be presented.

Fish—Species Occurrence and Use Areas

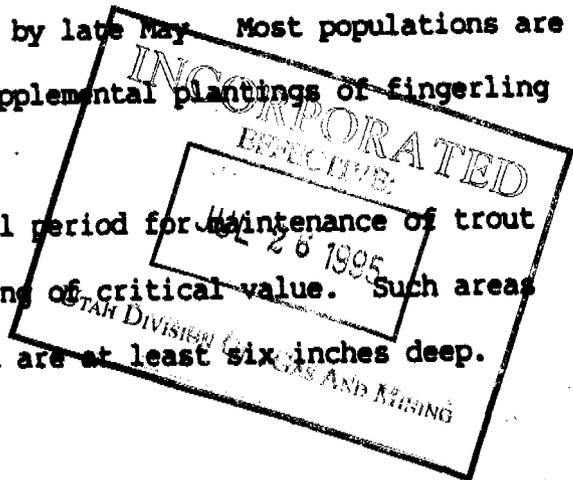
Aquatic habitats associated with the mine plan area support three species of game and four species of nongame fish; all of which are protected. Of these fish, four species have been determined to be of high interest to Utah (Appendix A).

The yellowstone cutthroat trout is an introduced species. It annually spawns between early May and mid-July. Most populations are sustained through natural reproduction; hatching is usually completed by mid-July.

The rainbow trout is an exotic species. Within Utah there are several different strains of this species. Generally speaking they spawn from mid-March through June; hatching is normally completed by late June. It is important to note that natural reproduction of this species is almost non-existent, since it is managed as a stocked population. This management scheme has resulted since their catchability is higher than other trout and the life expectancy of hatchery fish is short.

The brown trout is an exotic species. Its spawning period begins as early as mid-October and is normally completed by late December; hatching of eggs begins in the spring and is usually completed by late May. Most populations are sustained through natural reproduction and supplemental plantings of fingerling brown trout.

The spawning period represents a crucial period for maintenance of trout populations; spawning areas are ranked as being of critical value. Such areas are characterized by clean, gravel zones that are at least six inches deep.



These zones must be covered by a minimum of six inch deep water flowing at a velocity of not less than one foot per second. These physical parameters are necessary for optimum spawning success.

Once the cutthroat or rainbow trout have spawned, their eggs incubate in the reeds approximately 30 to 50 days—water temperatures ranging from 45° to 50° F. Brown trout eggs incubate throughout the winter which last approximately 100 to 150 days—water temperatures ranging from 35° to 40° F. During this crucial period water temperature affects the rate of embryonic development—the warmer the water the more quickly incubation is completed. It is also during this period that ongoing sedimentation can result in suffocation of the eggs. Fluctuations in stream flow also negatively affects incubation; wherever practicable, maintenance of a constant flow of water during the spawning period enhances reproductive success.

The mottled sculpin is a native species. It annually spawns in the spring between February and May. All of their populations are sustained through natural reproduction. The spawning period represents a crucial period for maintenance of sculpin population; spawning areas (nest) are ranked as being critical value. Such area for sculpin are characterized as a nest scooped out beneath a stone or other submerged object. Spawning areas must have clean gravel or rubble zones. Both the adult fish attend and defend the nest. They are know to spawn in water temperatures ranging from 45° to 48° F.

The Price River (sections 3 and 4) flows through the mine plan area; it supports fish life. All other streams associated with the project do not support fish life.

Section 4 of the Price River is ranked as being of substantial value to

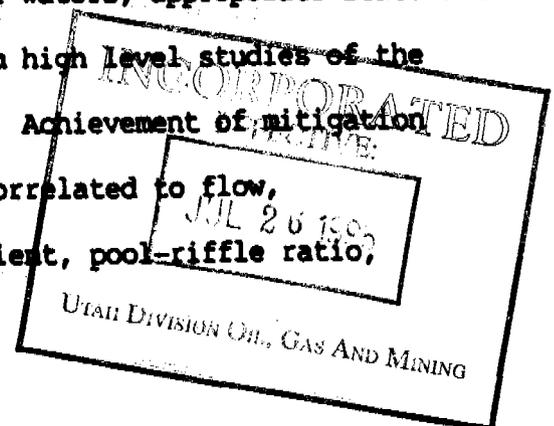
Utah's cold water fishery management program and is a Class 4 fishery. It may support limited natural reproduction of brown and cutthroat trout populations. Rainbow trout are also present. All of the trout primarily represent downstream drift from better quality upstream areas. This stream section is also inhabited by speckled dace, mountain sucker, carp and mottled sculpin.

Section 3 of the Price River is ranked as being of only limited value to Utah's cold water fishery management program and is a Class 5 fishery. It does not support natural reproduction of any trout populations, although some cutthroat trout are present. Speckled dace, mountain sucker and mottled sculpin are also present in this section.

It should be noted that Class 1 waters are the State's best "blue ribbon" fisheries and that Class 6 waters are dewatered during portions of the year. The Price River stream section associated with the project have suffered irrevocable damage due to past abuse that resulted from highway construction and other historic, industrial activities.

Although there are no fish in the other streams associated with the project, the flow of water from these sources is critical for the limited reproductive success of spawning trout and life processes of other aquatic wildlife in the Price River.

If the project operations are planned or develop that would alter, destroy or discharge polluting effluents into any perennial waters, appropriate state and federal permits, a mitigation plan and results from high level studies of the fishery resource would be required of the Company. Achievement of mitigation would demand detailed studies of stream velocity correlated to flow, representative of the stream channel profile, gradient, pool-riffle ratio,



substrata types identifying percent representation of each type and surface water information required for SMC 779.16.

If modification of flows is anticipated, instream flow requirements must be considered to meet the needs of the existing fisheries, "biological community" and maintenance of existing riparian or wetland zones. Such baseline information would allow for development of mitigation or reclamation plans that would allow for avoidance, lessening or mitigation of impacts to the fishery and maintenance or re-establishment of unique habitat types.

It is important to note that no species of fish having relative abundance so low as to have caused them to be federally listed as threatened or endangered inhabit the mine plan or adjacent areas. The endangered humpback chub, bonytail chub and Colorado squawfish inhabit the Green and Colorado Rivers. Additionally, the humpback (razorback) sucker also inhabits those rivers; it is likely that this species will one day be federally listed as threatened. It is not believed that implementation and operation of the Company's project will impact any of these species.

Terrestrial Use Areas

Wildlife Habitat Types

Of the nine wildlife habitat types present on the mine plan area wetlands and riparian habitats are ranked as being of critical value to all wildlife. These habitats are normally associated with drainage bottoms (ephemeral or intermittent), or perennial streams (UMC 700.5), seeps and spring within the upper Sonoran, Transition and Canadian life zones. Cliffs and their associated talus areas that lie within the upper Sonoran and Transition life zones are ranked as being of high-priority value to all wildlife. When compared to all

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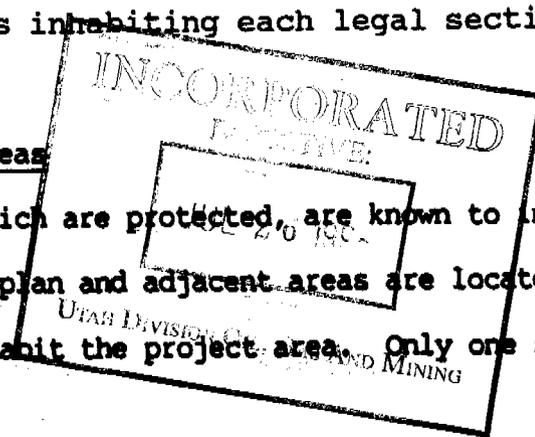
other wildlife habitats the aforementioned situations are considered to present unique habitat associations (Table 1, Appendix 10A).

Riparian and wetland areas are highly productive in terms of herbage produced and used by wildlife as compared to surrounding areas. Experience has shown that as much as 70 percent of a local wildlife population are dependent upon riparian zones. Cliffs and tallus are of special importance to many high interest wildlife.

It is important to note that each legal section of land represented by the mine plan and adjacent areas have been ranked as to its value for the total wildlife resource. Sections 31 through 35 of Township 12 South Range 9 East have each been ranked as being of critical value to wildlife. This is also true for sections 19 through 25 of Township 12 South Range 10 East; sections 1 through 11 and 14 through 18 of Township 13 South Range 9 East; and sections 1, 2 and 6 of Township 13 South Range 10 East. Sections 19 through 25 and 36 of Township 12 South Range 9 East have been ranked as being of high-priority value to wildlife. This is also true for sections 28 through 36 of Township 12 South Range 10 East; sections 12, 13 and 19 through 25 of Township 13 South Range 9 East; and sections 3 through 5, 7 through 24 and 28 through 30 of Township 13 South Range 10 East. These rankings were developed through an analysis of cumulative values for use areas of individual wildlife species inhabiting each legal section of land (Appendix 10A, Table 2).

Amphibians—Species Occurrence and Use Areas

Six species of amphibians, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that all of these species inhabit the project area. Only one species



of the amphibians inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The tiger salamander is a yearlong resident animal of the project area. The substantial value use area for the adult form is represented by any moist underground site or any similar habitat such as inside rotten logs, cellars or animal burrows. Such sites can be found within any wildlife habitat extending from the cold desert (upper Sonoran life zone) through the submontane (Transition life zone) and into the montane (Canadian life zone) ecological association. The larva form, often referred to as a mud-puppy, is a gilled animal that must remain in water within the above described ecological associations. It is interesting to note that the larva may fail to transform into an adult, even after their second season, and they can breed in the larva condition.

Once the larva is transformed into the adult form, the animal is primarily terrestrial. Salamanders do migrate to water in the spring for breeding and may remain there during much of the summer. Such an intensive use area would be ranked as being of high-priority value to the animal. In September the newly transformed animals leave the water to find suitable places to spend the winter.

The tiger salamander breeds from March through June and is sexually mature after one year. The male deposits a small tent-shaped structure containing a myriad of sperm on the pool bottom. During a courtship the female picks up this structure in her cloaca, then the eggs are fertilized internally before or just at the time they are laid. The eggs, singly or in small clusters, adhere to submerged vegetation; after 10 to 12 days they hatch. Obviously, a critical period for maintenance of the population is when breeding salamanders, eggs or their larva are inhabiting a water.

Post-embryonic development of a salamander's larval form progresses at a pace somewhat controlled by water temperature; in some cold waters the larva may not transform into an adult and drying up of a pool may hasten the process.

Migration to or from water usually occurs at night, during or just after a rain storm. When inhabiting terrestrial sites the tiger salamander is most active at night, particularly on rainy nights, from March through September.

Larva, when small, feed on aquatic invertebrates and become predacious to the point of cannibalism when they are larger. Food items for adults include insects, earthworms and occasionally small vertebrates.

No amphibians have relative abundances that are so low to have caused the animal to be federally listed as a threatened or endangered species.

Reptiles--Species Occurrence and Use Areas

Nineteen species of reptiles, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that seventeen of these species inhabit the project area. Only two species of the reptiles inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The Utah milk snake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the upper Sonoran (cold desert life zone) through the submontane (Transition life zone) and into the montane (Canadian and possibly Hudsonian life zone) ecological associations. Although its use area spans a multitude of habitats, the animal is extremely secretive, mostly nocturnal and is often found inside or under rotten logs, stumps, boards, rocks or within other hiding places. At night they can be found in the open where they hunt for small rodents, lizards and other small snakes. Occasionally, the milk snake may take small birds or bird eggs.

The milk snake may live beyond twenty years and it becomes sexually mature during its third spring season. After mating, which occurs during spring or early summer when they are leaving the den, female milk snakes produce clutches which average seven eggs. The eggs are secreted in a moist warm environment and then abandoned; incubation lasts 65 to 85 days. The site where an individual snake has deposited its clutch of eggs is of critical value to maintenance of the species.

The Utah mountain kingsnake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the submontane (Transition life zone) into the montane (Canadian and possibly Hudsonian life zones) ecological association. Little is known concerning this animal except that it frequents areas of dense vegetation and that it is often found near water. Its life history and food habits parallel that described for the Utah milk snake.

To date snake dens, which are protected and of critical value to snake populations, have not been identified on or adjacent to the project area. It is important to note that inventory for such has not been attempted. If the Company at some later time discovers a den, it should be reported to the Utah Division of Wildlife Resources. If a den(s) is currently known, its location must be included with the permit application.

No reptiles have relative abundances that are so low to have caused the animal to be federally listed as a ~~threatened~~ or endangered species.

Birds—Species Occurrence and Use Areas

Two hundred forty-nine species of birds, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas

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are located. It is probable that one hundred fifty-two of these species inhabit the project area. Thirty-seven species of the birds inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The great blue heron is a yearlong resident of the environs associated with the project. The bird's substantial valued use area is always associated with open water where it feeds on aquatic wildlife. The great blue heron normally nests in rookeries that are often coinhabited by snowy egrets and black-crowned night herons. The nest may be placed high in a tree along a lake or stream edge, however, they will nest on the ground. The rookery is ranked as being of critical value to herons; it is normally a traditional site and utilized year after year by a nesting colony. It is important to note that rookeries are abandoned if they become vulnerable to predation or experience continual disturbance. To date, no rookeries are known on the project area.

Both adult great blue herons participate in the incubation and rearing process. Three to five eggs are laid with a two or three day period between deposition of each egg. Incubation of each egg lasts about eighteen days; afterwhich the nestlings remain in the nest for about sixty days. This period is crucial to survival of the heron population.

Ducks commonly known as waterfowl are represented by five species that may, on occasion or during different seasons of the year, inhabit the mine plan area. All of these species are of high interest to the State of Utah (Appendix A). Generally speaking, the riparian and wetland habitats encompassed by the project and adjacent areas provide substantial valued habitats for waterfowl. Each species has different life requirements and makes various uses of the riparian and wetland environs associated with the project.

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For those waterfowl that nest locally, the period March 15 through July 15 is ranked as being of crucial value to maintenance of the population. Following incubation which, dependent upon the species, may vary between 20 and 28 days and extend up until mid-August, the riparian and wetland habitats represent a high-priority brooding area. Additionally, the wetland habitat (large open water areas or dense marshland none of which exist on the project area) is of high-priority for seclusion and protection of adult waterfowl during their flightless period when they molt. Males may begin the molt in early June and both sexes and the young are capable of flight by mid-August.

All wetlands and open water areas can become locally important as high-priority use areas for waterfowl during peak migration periods in the spring (March 15 through May 15) and fall (August 15 through October 15).

The project and adjacent areas provide substantial valued habitat for a multitude of raptors—turkey vulture, bald and golden eagles, four species of falcons (prairie, American peregrine and Arctic peregrine falcons and American kestrel), six species of hawks (goshawk, sharp-shinned, Cooper's, red-tailed, Swainson's and marsh hawks) and seven species of owls (barn, screech, flammulated, ~~great horned, pygmy, long-eared and saw-whet~~ owls). Many of these species are of high federal interest pursuant to 43 CFR, 3461.1 (n-1). All of these species are of high interest to the State of Utah (Appendix A).

Realistically, nesting habitat does not exist on the project or adjacent areas for most, if not all, of these species. However, if a species were to nest on or adjacent to the project area, it would have a specific crucial period during which the aerie would need protection from disturbance; this period of times lies between February 1 and August 15. Generally speaking, aeries

represent a critical valued site and need protection from significant or continual disturbances within a one-half kilometer radius of the nest. This consideration need only be implemented during the period of time that the nest is occupied. Species specific protective stipulations for aeries are available from the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

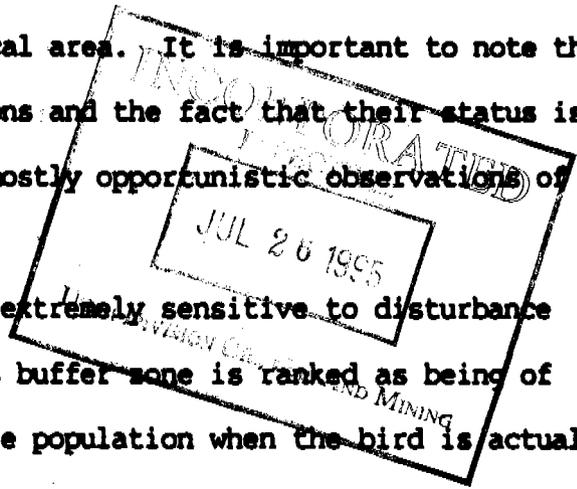
The current level of data relative to site specific use of the area by raptors is unsatisfactory. Likely, there are aeries that have not been identified. Many of these species are highly sensitive to man's disturbances. Therefore, it is recommended that intensive surveys be initiated proximal to planned surface disturbed sites on the mine plan and adjacent areas for determination of locations and raptor aerie territories.

Golden eagles are a common yearlong resident of the mine plan area. The following location represents a known active aerie territory. (Note, an aerie territory is utilized by one pair of eagles but may contain several nest sites.)

- a. NW-1/4 Sec. 5, T. 13 S., R. 9 E.

It is believed that other aerie territories may exist on the project area. This belief is based upon the fact that suitable nesting habitat is widespread on the mine plan area and throughout the local area. It is important to note that the regularity of golden eagle observations and the fact that their status is common has resulted in documentation of mostly opportunistic observations of aerie territories.

An active golden eagle nest site is extremely sensitive to disturbance within a one-half kilometer radius. This buffer zone is ranked as being of critical value to maintenance of the eagle population when the bird is actually utilizing the aerie; that period of time is normally between April 15 and June



15. The radius for a buffer zone may need to be increased to one kilometer if a disturbance were to originate from above and within direct line of site to the eagle aerie.

To date there are no known high-priority concentration areas or critical roost trees for golden eagles on the project area. The mine plan and adjacent areas have been ranked as being of substantial value to golden eagles.

The northern bald eagle is an endangered winter resident (November 15 to March 15) of the local area. To date there are no known high-priority concentration areas or critical roost trees for this species on or adjacent to the project. The mine plan area has been ranked as being of substantial value to wintering bald eagles. Note that no bald eagles are known to nest in Utah; however, historic data documents nesting activity by these birds in the State. There is no known historic evidence of the northern bald eagle nesting on the mine plan or adjacent area.

The American peregrine falcon (relative abundance is endangered) and the prairie falcon (relative abundance is common) are yearlong residents of the mine plan and adjacent areas. Each of these species utilizes cliff nesting sites. To date there are no known aerie sites for cliff nesting falcons on the project area. However, suitable nesting habitat for the prairie falcon is widespread and suitable nesting habitat for the American peregrine falcon may be found at specific, but limited, sites on the mine plan and adjacent area. Since their existence on the area would not be unlikely, the project area has been ranked as being of substantial value to these two cliff nesting falcons.

For each falcon their aerie site, while being utilized and a one-half kilometer radius, would be ranked as being of critical value to maintenance of

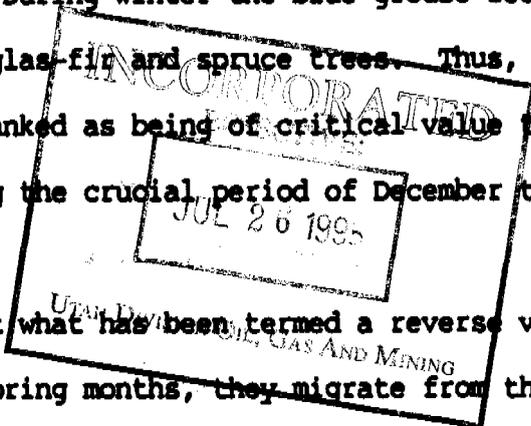
their populations. The falcon's period of use at the aerie site spans the spring and early summer period—prairie falcon, April 15 to June 30; peregrine falcon, March 1 to June 30.

The level of data relative to site specific use of the project area by cliff nesting falcons (not including the kestrel) is unsatisfactory and there could be aeries that have not been identified. Therefore, it is recommended that intensive surveys be initiated on the area for determination of locations for cliff falcon aerie sites.

The endangered arctic peregrine falcon is a winter resident (November 15 through March 15) of the local area. This species has not been observed to utilize the environs on or adjacent to the mine plan area, however, its occasional presence would not be unlikely. Therefore, the project area is ranked as being of limited value to this species.

The blue grouse is a yearlong resident of the project area. Adult birds prefer open stands of conifers. During winter the blue grouse feeds exclusively upon the needles and buds of Douglas-fir and spruce trees. Thus, this wildlife habitat (spruce-fir forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February.

Blue grouse annually exhibit what has been termed a reverse vertical migration. That is during the spring months, they migrate from the high elevation spruce-fir habitat to lower elevation sagebrush, pinion-juniper or shrubland habitats. This movement is caused by a need of the birds to feed on early developing vegetation. Such movement also facilitates successful breeding, nesting and brooding of their young. Then as the year progresses, they move to the higher elevations.



The males are polygamous and will set up and defend territories for booming and breeding activities against other breeding males. Such territories are critical to maintenance of the population during the crucial period of mid-March through mid-June.

After breeding, the female develops a nest site which is secreted on the ground; the nest is of critical value to maintenance of the blue grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young blue grouse, while being brooded, rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to blue grouse. The crucial period extends from hatching into mid-August.

As summer progresses into the fall season, the grouse consumes large quantities of berries.

The ruffed grouse is a yearlong resident of the project area. These grouse are usually found in the continuum of habitats extending from aspen to shrubland types. But, during winter they often roost in dense stands of conifers. Generally speaking, ruffed grouse prefer habitats lying within 0.25 mile of a stream course; such areas are ranked as being of high-priority value to their population. During winter the ruffed grouse feeds exclusively upon staminate aspen buds. Thus, this wildlife habitat (aspen forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February. During the remainder of the year their diet shifts to include a wide variety of plant and insect material.

Ruffed grouse do not exhibit any type of seasonal migration.

The males are polygamous and will set up and defend territories against other breeding males. The focal point for breeding activity is the drumming log; all such logs are ranked as being of critical value to grouse since they represent sites of historical use. Such territories are critical to maintenance of the population during the crucial period of early March through May.

After breeding the female develops a nest site which is secreted on the ground and deep within an aspen grove; the nest is of critical value to maintenance of the ruffed grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young ruffed grouse, while being brooded, rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to ruffed grouse. The crucial period for brooding extends from hatching into mid-August.

Sage grouse are yearlong residents of the portion of the project area on the West Tavaputs Plateau that lies above the cliffs. Within their substantial valued yearlong use area, there exists critical valued winter ranges, critical valued leks (strutting grounds) with associated brooding areas and high-priority valued summer ranges. Sage grouse are only found in habitats dominated by sagebrush or proximal to sagebrush areas—riparian and wetland, pasture and fields, sagebrush and shrubland habitats—within the submontane life zone.

Due to a specialized digestive system which lacks a muscular gizzard, sage grouse are solely dependent on soft material for food. Sagebrush flowers and

leaves are utilized yearlong for food. Sagebrush seed is consumed during the period of the year when it is available. This use of sagebrush, leaves, flowers and seeds is almost exclusive of any other herbage materials for all age classes of sage grouse from October to April. During other months sagebrush for adult birds still represents 45 to 85 percent of the bird's diet; forbs make up the remainder of the diet.

Immature sage grouse rely heavily on insects for food during their first eight weeks of development. During the chick's first two weeks, 80 percent of its food is insects. The intake of insects decreases to only a trace by their eighth week. On the average nearly 35 percent of the volume of the diet during the first eight weeks of growth for a sage grouse chick can be insects. The remainder of their diet consists of forbs and sagebrush.

Open areas surrounded by sagebrush are often utilized by sage grouse as leks (strutting grounds) during the crucial breeding season that spans March 15 through June 15 (no such sites are on the project area). Wet meadows are especially sought out for strutting grounds. Such areas that have demonstrated use are of critical value to maintenance of sage grouse populations. Suitable habitat within a two-mile radius of leks are ranked as being critical value and are utilized by hens for nesting and brooding up through mid-August. Leks and the associated nesting-brooding areas are utilized year after year. As the summer season progresses, the sage grouse as small flocks or individuals disperse over their entire substantial valued use area. During the period between mid-August and mid-November, this area is ranked as being a high-priority summer range.

With the onset of winter during mid-November, the sage grouse move to their

critical value winter range, which in this region is normally that habitat that was earlier utilized for nesting and brooding activities. They remain dispersed throughout the winter range until the breeding season which begins in mid-March.

Riparian areas and adjoining wildlands associated with the Price River provide yearlong, substantial valued habitats for California quail. Due to the quail's complete dependency on the riparian systems, it is ranked as being of critical importance to this species. In this area, quail depend primarily on wild grains and insects. High quality habitat must retain adequate cover and food for the birds use throughout the year.

Quail initiate nesting as early as mid-April and continue into mid-July. This period of time and successful nesting activities is of crucial importance to the maintenance of their population.

The chukar is a yearlong resident of the project area. It is important to note that they are an exotic species introduced from Asia during the 1950's. These birds prefer open rocky areas in the cold desert and submontane ecological associations. During summer chukars feed on grass shoots and insects, but during winter their diet is primarily seeds. Their substantial valued habitats are the cliffs and tallus type and the associated desert scrub or shrubland types.

The winter season is a crucial period (early December through mid-February) for chukars; the birds concentrate on selected areas. Winter range has been ranked as being of critical value to over-winter survival of the chukar populations. Disturbance on winter range must be avoided when chukars are present.

Chukars are monogamous; the pairs nest between early April and late May. Nest sites are critical to maintenance of the population during the crucial nesting period.

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It is important to note that all sources of water within the substantial valued use area for chukars are critical to maintenance of their populations on a yearlong basis.

The band-tailed pigeon is a summer resident of the Wasatch Plateau portion of the project area. This bird is seldom observed to utilize the Wasatch Plateau but when observed, the species is only represented by a single bird, pairs or even less frequently a small flock. Since the bank-tailed pigeon's use of the Wasatch Plateau is best described as "occasional", the environs associated with the project are only ranked as being of limited value to the bird. Nesting birds secrete their nest in trees within the spruce-fir wildlife habitat. Peak on-nest activity occurs in late July and early August.

Mourning doves normally inhabit the project and adjacent areas, which represents a substantial valued use area for these birds, between May 1 and September 15 each year. They nest throughout most of this period and each pair produces two clutches. The pinion-juniper and riparian habitats are ranked as being of high-priority value for nesting. Locally, mourning doves show two peaks in on-nest activity—early July and early August. Successful nesting activities and any water sources are critical to maintenance of the mourning dove population.

The yellow-billed cuckoo is a summer resident of the project area. This bird only nests in the riparian wildlife habitat, therefore, such areas are of critical value to the maintenance of this species. Little is known concerning the yellow-billed cuckoo. Its nest is represented by a frail, saucer-shaped structure of twigs and is always placed in bush or tree.

The black swift is a summer resident of the Wasatch Plateau. The montane

ecological association represents the swift's substantial valued use area. Normally, the bird is associated with small flock that represents a colony. Black swifts are usually observed soaring as pairs and they feed upon flying insects. A colony's nests are scattered along precipitous terrain where the nest is often secreted behind a waterfall. Such a moist habitat is not known to exist on the project area. Cliff and tallus wildlife habitats are ranked as being of high-priority value to the black swift. There is evidence that pair bonds are long lasting and that a nest may be utilized in successive years.

The belted kingfisher is a yearlong resident of the project area. It is found only along riverine systems and its substantial value use area extends from the cold desert through the submontane and into the montane ecological associations. Therefore, the riparian wildlife habitat represents a high-priority valued use area for this bird. It feeds exclusively upon fish. The kingfisher's nest is always secreted within a burrow along stream banks, thus, dirt bank habitats along riparian areas are of critical value to this bird.

The pileated woodpecker is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). The spruce-fir and aspen wildlife habitats of the montane ecological association represents this bird's substantial valued use area. It is important to note that the pileated woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In area of the State where the bird is known to exist, it is a yearlong resident with a relative abundance considered to be rare.

The Williamson's sapsucker is another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Typically, the substantial valued use area for this species is the spruce-fir habitat of the subalpine life zone in the montane

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ecological association. Therefore, the spruce-fir habitat of the Canadian life zone on the project site would only represent the substantial valued use area for the yellow-bellied sapsucker. The yellow-bellied sapsucker is a yearlong resident of the environs associated with the project area and it has a relative abundance considered to be common. Where as the Williamson's sapsucker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the Williamson's sapsucker is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

The Lewis woodpecker is also another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is represented by riparian habitats characterized by cottonwood stands and ponderosa forests. These habitats do not exist on the project site. It is important to note that the Lewis woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a summer resident or only a transient. Its relative abundance is unknown.

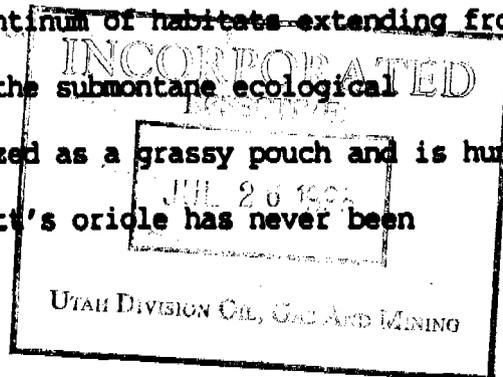
The purple martin is a summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. In Utah its substantial valued use area is represented by open spruce-fir, aspen or ponderosa forest habitats of the montane ecological association. The purple martin feeds on flying insects and may secrete its nest within any suitable above-ground cavity.

The western bluebird is an uncommon summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. Where as the mountain bluebird is a common yearlong resident of the area. Both birds are

cavity nesting species. The western bluebird nests from the pinion-juniper habitat of the submontane ecological association up into the lower forest habitats within the Canadian life zone of the montane ecological association. The mountain bluebird utilizes the same continuum of habitats for nesting, but also extends its nesting use across the Canadian and Hudsonian life zones and into the Alpine life zone. During winter, both species show elevational and longitudinal migrations; they then utilize all habitats associated with the cold desert ecological association. Therefore, the substantial valued use area for each species spans a broad continuum of habitats. It is important to note that trees with cavities located on the project area can be of critical value to bluebirds.

Grace's warbler is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is shrublands and associated ponderosa forest habitats of the submontane and montane ecological associations. This bird's nest is built twenty or more feet above ground in a ponderosa tree. It is important to note that the Grace's warbler has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the state where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

Scott's oriole is also a species having high federal interest pursuant to 43 CFR 3451.1 (n-1). Its substantial valued use areas are riparian habitats characterized by cottonwood stands and the continuum of habitats extending from the pinion-juniper forest into shrublands of the submontane ecological association. The oriole's nest is characterized as a grassy pouch and is hung in a tree. It is important to note that the Scott's oriole has never been



documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the state where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

The grasshopper sparrow is a rare transient species known to inhabit the environs of the biogeographic area that surrounds the project site. It only frequents dry grassland areas in the desert scrub habitat of the cold desert ecological association during spring and fall migration periods. Since its use of such sites is best described as "occasional", those habitats in the region are only ranked as being of limited value to the bird.

Mammals—Species Occurrence and Use Areas

Eighty-eight species of mammals, of which 22 percent are protected, are known to inhabit the biogeographic area in which the project and adjacent areas are located. It is probable that seventy-nine of these species inhabit the project area. Twenty-seven species of the mammals inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The dwarf (least) shrew is a yearlong inhabitant of the biogeographic area that surrounds the project site. This animal's substantial valued use area is characterized as open grass covered areas of any wildlife habitat in the submontane and montane (Canadian life zone) ecological associations. Since this shrew has a relative abundance determined to be limited, its use areas should be ranked as being of high-priority value to the animal.

The red bat is a summer resident of the biogeographic area that surrounds the project site. The animal roosts in wooded areas (riparian woods and pinion-juniper forests) of the submontane ecological association. Such areas represent this animal's substantial valued use area. An occasional individual has been known to utilize caves; those individuals could hibernate and remain over winter.

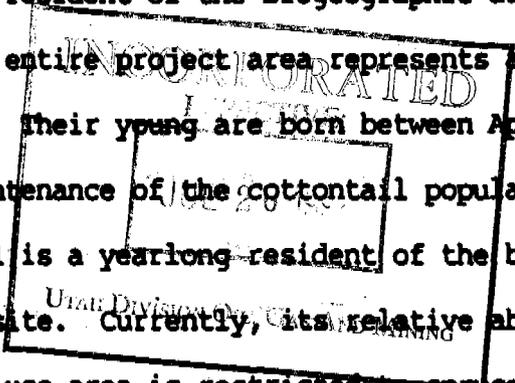
The western big-eared bat is a yearlong resident of the biogeographic area that surrounds the project site. This animal roosts and hibernates within caves, mine tunnels or suitable buildings located in the pinion-juniper, shrubland and low elevation spruce-fir habitats of the submontane and montane (Canadian life zone) ecological association. Such areas represent this bat's substantial valued use area.

The spotted bat may inhabit the project area. Little is known concerning this specie.

The snowshoe hare is a yearlong resident of the biogeographic area that surrounds the project site. Its relative abundance has been determined to be limited, since its substantial valued use area is restricted to the spruce-fir and nearby aspen and riparian habitats of the montane (Canadian and Hudsonian life zones) ecological association. Such areas are ranked as being of high-priority value to the animal during its breeding season which spans the period between early April and mid-August.

The cottontail rabbit (mountain cottontail inhabit sites lying between 7,000 and 9,000 feet in elevation and desert cottontail inhabit sites lower than 7,000 feet in elevation) is a yearlong resident of the biogeographic area that surrounds the project site. The entire project area represents a substantial valued use area for cottontails. Their young are born between April and July. This is a crucial period for maintenance of the cottontail population.

The northern flying squirrel is a yearlong resident of the biogeographic area that surrounds the project site. Currently, its relative abundance is unknown. Its substantial valued use area is restricted to spruce-fir or other mixed conifer habitats of the montane (Canadian and Hudsonian life zones)



ecological association. This specie is the only nocturnal squirrel in Utah. The flying squirrel may build its nest within an old woodpecker hole or it may build an outside nest of leaves, twigs and bark. Mating occurs twice in each year—February through March and June through July. Afterwhich, two to six young are born after a gestation period of 40 days—April through May and August through September. These periods are of crucial value to maintenance of their populations. During winter, flying squirrels are gregarious; 20 or more have been known to den together.

Beavers are yearlong inhabitants in the biogeographic area that surrounds the project site. Their substantial valued use area is restricted to riparian and adjacent aspen habitats (those located within 100 meters of the riparian zone) in the cold desert, submontane and montane (Canadian life zone) ecological associations. These animals construct a conical shaped lodge in which a family group lives throughout the year. The lodge is of critical value to maintenance of the beaver population. One litter of kits is produced each year; they are born between late April and early July after a gestation period of 128 days. Kits and yearlings coinhabit the lodge with the adult pair. When they attain 2 years of age they are forced to leave; females can breed at 2.5 years of age. Due to the animals dependency upon flowing water and the associated riparian vegetation, the riparian wildlife habitat is ranked as being of critical value to beaver population.

The red fox and kit fox are yearlong inhabitants of the biogeographic area that surrounds the project site. The substantial valued use area for the red fox would include all wildlife habitats extending from the cold desert through the montane (Canadian life zone) ecological associations. The substantial valued use

area for the kit fox is restricted to all of the habitats of the cold desert ecological association and extends into the sagebrush and pinion-juniper habitats of the submontane ecological association. Almost nothing is known of their population dynamics. Without doubt, a crucial period for both species is when they are caring for young in the den. Dens, while being inhabited, are a critical use area.

The gray wolf is a historic inhabitant of the biogeographic area that surrounds the project site. Currently, its relative abundance is so low that the animal is listed as endangered with extinction. The wolf's substantial valued use area would be represented by any remote habitat in any ecological association.

Black bears are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is represented by all natural wildlife habitats (excluding the pasture and fields and urban or parks types) extending from the submontane into the montane (Canadian and Hudsonian life zones) ecological associations. These animals go into a semi-hibernation during winter. During this crucial period, which may last from December through March, the animal secretes itself in a den in order to conserve body energy reserves. The young are born in the den during January or February. Dens, while being inhabited, represent a critical valued use area for bears.

Many of the members of the family mustelidae are known to inhabit the biogeographic area that surrounds the project site. They are all protected and classified as furbearers—short-tailed and long-tailed weasels, mink, wolverine, black-footed ferret, marten, badger, striped and spotted skunks and the river otter. Additionally, raccoon and muskrat, although not furbearers, are also

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inhabitants of the biogeographic area that surrounds the project site. All of these species are of high interest due to their value in the fur market.

The substantial valued use area for short-tailed and long-tailed weasels, mink, muskrat and raccoons is the riparian habitat. Weasels, which are inhabitants of the project site, do make some use of other habitats that are proximal to riparian zones. Muskrats and raccoons are restricted to riparian habitats of the cold desert and submontane ecological association; thus, they are found on the project area. The long-tailed weasel can be found from the cold desert up into the montane (Canadian and Hudsonian life zones) ecological associations. Short-tailed weasel and mink populations extend their use from the submontane into the montane ecological association. It is important to note that the weasel is restricted to the Canadian life zone, where as mink utilize the Canadian and Hudsonian life zones. The river otter is not known to inhabit the environs of the project area, but mink are present.

The substantial valued use area for marten and wolverine is the montane ecological association. The marten does not utilize the Alpine life zone, but the wolverine can be found at that elevation. Only the wolverine has potential to be found in the environs of the project site.

The black-footed ferret is a species primarily dependent upon prairie dogs as a prey source. Currently, the ferrets' relative abundance is so low that the animal is endangered with extinction. Utah lies on the western edge of the black-footed ferrets' historic range. The substantial value use area for this species is restricted to prairie dog colonies. Prairie dog colonies are found within a multitude of wildlife habitats within the cold desert, submontane and montane (Canadian life zone) ecological associations. It should be noted that

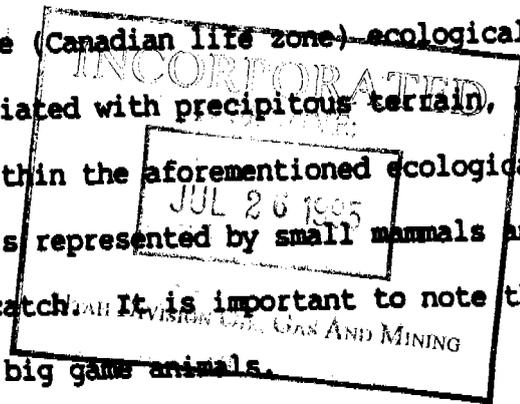
the project site does not provide habitat for prairie dogs; thus ferrets would also be absent.

The substantial valued use area for badger and skunks span all wildlife habitats other than dense forests in the cold desert, submontane and montane (Canadian life zone) ecological associations. Skunks show some affinity for habitats proximal to water. Skunks and badgers are dependent upon a suitable prey course.

A crucial period for maintenance of all furbearers, raccoons and muskrat populations is when they have young in a nest, den or lodge. Such sites are critical for reproductive success.

Bobcat, Canada lynx and cougar are known to inhabit the biogeographic area that surrounds the project site. For all of these species, a crucial period for maintenance of their population is when the female has her young secreted at a den site. Such sites are of critical value when being utilized. It is also crucial to their survival that a female accompanied by young not be killed or harassed.

The substantial valued use area for bobcats extends from the cold desert through the submontane and into the montane (Canadian life zone) ecological association. The bobcat is normally associated with precipitous terrain, but has been observed in every wildlife habitat within the aforementioned ecological associations. Their primary prey source is represented by small mammals and birds or any other small animal they can catch. It is important to note that bobcats occasionally do kill the young of big game animals.



The substantial valued use area for the Canada lynx is restricted to the Canadian and Hudsonian life zones of the montane ecological association.

Normally, this cat would only be expected to utilize riparian and forested wildlife habitats. The lynx is similar in predation habits to the bobcat.

The substantial valued use area for the cougar (locally known as mountain lion) extends from the submontane into the montane (Canadian and Hudsonian life zone) ecological associations. Due to the dependency of the cougar upon mule deer as a prey source, a ranking of the mountain lion's seasonal distribution parallels that of the deer.

Mule deer are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the cold desert through the submontane and montane ecological associations. In some situations, deer show altitudinal migrations in response to winter conditions. There are, however, habitats where deer reside on a year-long basis.

Migration of mule deer from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting season coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the deer's urge to migrate and continued adverse weather keeps the deer on the winter range.

A portion of the project site represents winter range for mule deer herd Units 27b and 32. Winter ranges for mule deer are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and March 15 each year. During winters with severe conditions, the higher elevation portion of the winter range becomes unavailable to deer due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the deer; these sites are ranked as being of critical value.

Critical value sites must be protected from man's disturbance when the deer are physically present on the range.

Deer begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area represent only deer herd Unit 32. They are ranked as being of high-priority value to mule deer. In instances where extent of summer range is the major limiting factor for a deer herd, those summer ranges are ranked as being of critical value.

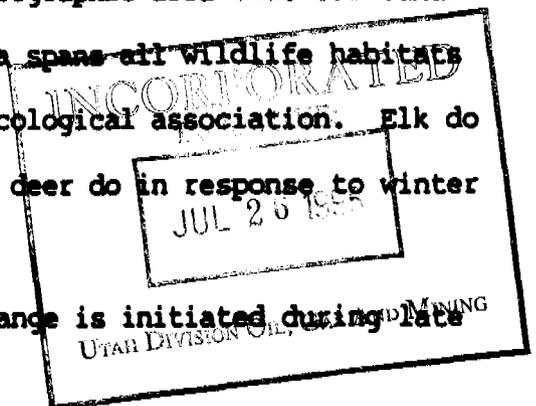
Mule deer fawn during the month of June. The continuum of wildlife habitats extending from the pinion-juniper through the shrubland and into the aspen type probably represents the fawning area. All riparian areas are of critical value for fawning and maintenance of the deer population. To date, no specific areas showing annual use for fawning are known. It is probable that such areas exist; they would be ranked as being of critical value to deer. It is important to note that June represents a crucial period for maintenance of deer populations.

Agriculture areas nearby to the project site are utilized yearlong by mule deer. Their use is sometimes intensified during the winter and spring periods.

Moose are inhabitants of the biogeographic area that encompasses the project site. To date, little else is known of their use area as it relates to the project.

Rocky mountain elk are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the submontane through the montane ecological association. Elk do not show as strong of altitudinal migration as mule deer do in response to winter conditions, but they do migrate to wintering areas.

Migration of elk from summer range to winter range is initiated during late



October; probably, the annual disturbance of the fall hunting seasons coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the elk's urge to migrate and continued adverse weather keeps elk on the winter range.

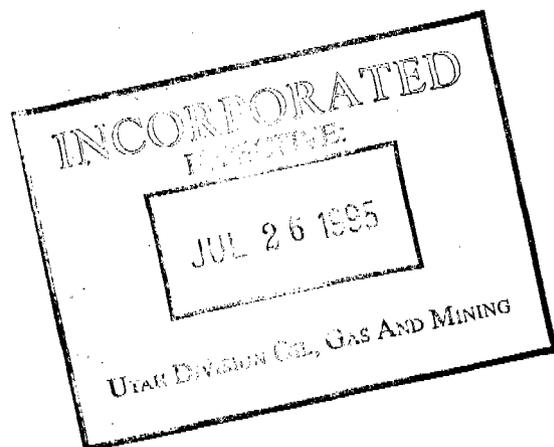
A portion of the project site represents winter range for the Manti elk herd and the Avintiquin elk herd. Winter ranges for elk are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions, some portions of the winter range become unavailable to elk due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the elk; these sites are ranked as being of critical value. Critical valued sites must be protected from man's disturbances when the elk are physically present on the range.

Elk begin their migration back to summer range during mid-May and remain there throughout October. There are no summer ranges for elk on the project area.

Elk calf during the month of June. Their preferred calving areas are best described as aspen forests with lush understory vegetation. All riparian areas on the summer range are of critical value for calving and maintenance of the elk population. To date, no specific areas showing annual use for calving are known. It is probable that such areas exist; they would be ranked as being of critical value to elk. It is important to note that June represents a crucial period for maintenance of elk populations.

Currently, there are no other known high interest wildlife species or their habitat use areas on or adjacent to the project area. It is not unreasonable to

suspect that in the future, some additional species of wildlife may become of high interest to the local area, Utah or the Nation. If such is the case, the required periodic updates of project permits and reclamation plans can be adjusted and appropriate recommendations made.



10.2 PROTECTION PLAN FOR FISH AND WILDLIFE AND RELATED ENVIRONMENTAL VALUES

10.2-1 Access Control

Most recommendations and advice received to date from both private consultants and wildlife management agencies, seems to conclude that protection of wildlife is being achieved by non-interference. It is most reasonable that CGCC, as operator of a large coal reserve, make it primacy thrust for wildlife protection the limitation of access to all controlled lands.

Mine sites are restricted to mine personnel and occasional visiting regulatory authorities. General mine personnel are confined to mine site facilities and strongly discouraged from adventuring from the disturbed perimeter. All access roads to internal areas of the property are blocked by locked gates. Ingress to outlying areas is limited to designated members of the engineering staff, the survey crews, monitoring subsidence, leases of grazing lands and infrequent work crews for gate and road maintenance. It is the continuing policy of CGCC's management that all subject lands are off limits to hunting (although we are aware that complete prevention of access by the general public is impossible, as evidenced by chronic vandalism of our gates).

10.2-2 Minimizing Disturbance by Mine Facilities

It should be clear to all that the development of an underground coal reserve necessitates surface disturbance for mine access and support facilities. The extent of disturbance is controlled by various factors, including the type of facility (i.e., portal, maintenance support, coal processing), number of employees and distance from existing public facilities (i.e., roads, powerlines, gaslines, etc.). The costs of facility development precludes wanton and excessive disturbance of natural areas. The most efficient operations are

generally the most compact. It is then accurate to state that an attempt is made by CGCC to minimize surface disturbance; therefore, impact on wildlife habitat.

The choice of location of the mine facility can be related to its impact on wildlife, however, site locations are often limited by geo-physical conditions and extent of land holdings. The majority of existing CGCC surface facilities are on existing mine or townsites. Future operations will, with the exception of Crandall, Rains and Dry Canyons, be re-developments of former un-reclaimed mine sites. Prior to any development in undisturbed areas, wildlife management agencies will be consulted for the development of site specific wildlife inventory and mitigation plans, much like those completed for Crandall Canyon (appendices to this chapter), to supplement the general wildlife information included in 10.1.

10.2-3 Employee Indoctrination to Wildlife and Environmental Values We

have stated that impacts on wildlife can be best minimized by non-interference. The achievement of a successful impact mitigation program must be derived through the development of a general awareness of wildlife problems. Toward this end, CGCC plans a policy of employee indoctrination on wildlife and related environmental values, various statutory requirements and environmental programs. The training will be implemented as part of the ongoing yearly safety re-training program, mandatory for all company employees. This training will include, in part, the recently developed Division of Wildlife Resources narrated slide presentation on mitigation of impacts on wildlife.

Other job specific indoctrination programs have been developed which will aid in minimization of impacts to fish and wildlife. All personnel responsible for handling waste oils and solvents are made aware of spill prevention and

cleaning procedures. CGCC has also established an environmental compliance and reclamation crew (ECR) which undergoes continual environmental awareness training as needed to perform their function of drainage control maintenance, reclamation work and response to environmental emergencies.

10.2-4 Powerline Design and Raptor Protection

CGCC has designed and constructed all powerlines since 1976, in accordance with guidelines set forth in environmental criteria for electric transmission systems (USDI, USDA, 1970). Pre-existing transmission facilities were surveyed in August of 1981 by Ron Joseph, U.S.F.W.S., and found to be either properly constructed to minimize electrocution danger, or so located as to pose no significant threat to perching raptors. (See Oct. 9, 1981, letter from Fish & Wildlife Service in Appendix 10D). Should an existing non-complying structure become a problem, it will be upgraded to present standards or replaced with a complying structure.

10.2-5 Protection of Waterways from Mining Impacts

All existing mine sites maintain on-site drainage controls which include ponds for runoff collection, berms and diversions. Impacts to fisheries caused by sedimentation are minimized by maintenance of these facilities. Potential pollution by petrochemicals is minimized by containment of tanks within berms, control and containment of runoff from equipment washdown areas and an emergency spill response team composed of management personnel. Additionally, CGCC has a testing, containment and inspection program for all PCB contaminated electrical equipment.

Where feasible, the 100 foot statutory buffer zone for intermittent and

perennial streams will be maintained. All crossings of perennial streams will be made with bridges or culverts depending on topographic or engineering demands. Ephemeral stream crossings on low use roads will, when approved by the regulatory authority, be made through stabilized areas of the channel.

The reduction of sedimentation and enhancement of wildlife habitat will be achieved by revegetation of road and pond embankments and other low and non-use disturbed areas of the mine site.

10.2-6 Restoration and Enhancement of Wildlife Habitat

Restoration of disturbed areas will ultimately be achieved by natural succession of the reclaimed and stabilized mine sites. Plans for such reclamation activities are included in Chapter IX, Vegetation Information and Revegetation Plans. Most of this type activity cannot occur until all mining is completed. Interim revegetation activities on low use areas, road embankments, topsoil piles and former drill sites may enhance use of some of these areas by increased forage and cover potential. During our drilling program (1970 through 1977), several high country ponds were constructed, catching seeps, for use by grazing animals. These ponds are, undoubtedly, used by local wildlife, as well.

10.2-7 Roads and Other Potential Barriers to Wildlife Migration Routes

Wildlife management agencies have been consulted about existing facilities and have to date, found no significant barriers to wildlife migration. Prior to the construction of any future roads or beltlines, wildlife agencies will be again consulted in planning stages for the development of mitigation plans.

10.2-8 Agency Notification of Observed High-Interest Wildlife Activity

CGCC has a continuing policy of notification of UDWR personnel at the Price Office when raptor nesting-sites are observed. Movement and appearances of large wildlife, such elk herds and bears, are also generally communicated to UDWR.

CGCC will continue to inform UDWR of such activities and solicit their advice on wildlife management activities.

10.2-9 Reporting of Threatened & Endangered Species

Castle Coal Company will promptly report to the Division, the presence of any threatened or endangered plant or animal species of which the Company becomes aware of that have not been previously reported.

10.2-10 Miscellaneous Commitments:

Castle Gate Coal Company will, to the extent possible, control and suppress range, forest, coal fires not approved by the Division.

Castle Gate Coal Company will not use persistent pesticides unless approved by the Division.

10.2-11 BLM CONDITIONS

The following additional conditions have been required by the Bureau of Land Management relating to any proposed new disturbances upon their controlled lands.

Condition No. 1

Where golden eagle nests are found in the future, exploration will not occur within 0.5 miles of the nest when surface disturbances would be below or above the nest.

Condition No. 2

Exploration will not be allowed on deer or elk critical winter range during the period November 1 through May 15.

Condition No. 3

Where elk calving areas are identified in the future, exploration activities would not be allowed during the period June 1 through July 15.

Castle Gate Coal Company does not anticipate any new surface disturbances at this time on BLM land. We do, however, commit to these considerations for wildlife protection.

Castle Gate Coal Company will, to the extent possible, design, construct, utilize and maintain all transportation facilities required for operation of the mine to minimize impacts to fish and wildlife.



APPENDIX 10-A
FISH AND WILDLIFE RESOURCES INFORMATION
AND
PROTECTION PLANS

SPECIES LIST OF VERTEBRATE WILDLIFE

SPECIES LIST OF VERTEBRATE WILDLIFE
THAT INHABIT SOUTHEASTERN UTAH

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UTAH STATE DIVISION OF WILDLIFE RESOURCES

Douglas F. Day, Director

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Agencies and individuals that have contributed information on species distribution within the southeastern region are acknowledged. Bureau of Land Management and U.S. Forest Service biologists provided information concerning local sightings and distribution of wildlife species. Species lists obtained from Arches and Canyonlands National Parks were also helpful. Within the Utah Division of Wildlife Resources, local conservation officers and wildlife biologists provided valuable information on species within their districts or areas of experience. Thanks go to other Division personnel who assisted with review of this document.

The status and population trend for individual species is a product of the experience of the authors and others who have professional experience with the wildlife resource in southeastern Utah.

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**SPECIES LIST OF VERTEBRATE WILDLIFE
THAT INHABIT SOUTHEASTERN UTAH**

Utah is believed to be inhabited by 734 species of vertebrate wildlife. Four hundred forty-five of these species are protected: 2 amphibians, 2 reptiles, 26 mammals, 48 fish and 357 birds. One hundred of the protected species are game species: 10 species of big game; 20, fish; 10, furbearers; 43, migratory game birds; 5, small game mammals; and 12, upland, small game birds. Table 1 provides a comparison of inhabitation by game species between Utah Division of Wildlife Resource's five regions.

Southeastern Utah is inhabited by 466 species of vertebrate wildlife in six biogeographic areas (Table 2). Three hundred forty-three of these species are protected: 2 amphibians, 26 mammals, 38 fish and 277 birds. Seventy-nine of the protected species that inhabit southeastern Utah are game species: 9 species of big game; 13, game fish; 9, furbearers, 35, migratory game birds; 4, small game mammals; and 9, upland, small game birds.

Southeastern Utah has been divided into six biogeographic areas. Each area allows an overlap if wildlife species that inhabit contiguous low and high elevation areas. This procedure was utilized to reduce any controversy that would normally arise from a "sharp line" drawn on a map.

- A - Wasatch Plateau extending east from Skyline Drive to Highway 10 and bounded on the north by Highway 6 and on the south by Interstate 70.
- B - West Tavaputs Plateau including all drainages into the Price River drainage from Soldier's Summit east along Reservation Ridge and including the drainages into Argyle, Nine Mile and Minnie Maud creeks; bounded on the east by the Green River and south and west by Highway 6.
- C - East Tavaputs Plateau bounded on the east by the Colorado-Utah state line; on the south by Interstate 70; on the west by the Green River and on the north by Uintah-Ouray-Indian Reservation and the Uintah-Grand county line.
- D - San Rafael Swell and San Rafael Desert bounded by Highway 6 on the north; Highway 10 on the east; the Green River on the east and the Emery-Wayne county line on the south.
- E - Henry Mountains and Burr Desert bounded on the north by Emery-Wayne county line; the Green and Colorado rivers on the east; Lake Powell on the south and Capitol Reef National Park and the Waterpocket Fold on the west.

F - Mountains and deserts of Grand and San Juan counties south of Interstate Highway 70 and north of the San Juan River bounded on the east by the Utah-Colorado border and on the west by the Green and Colorado rivers and Lake Powell.

Each species is listed by common name followed by the generic and specific nomenclature. The status for each species was determined by the authors after evaluation and consultation from several sources. The listing for mammals was developed from Sparks (1974), Burt and Grossenheider (1976) and Durrant (1952). The primary sources consulted in compiling the bird list were Behle and Perry (1975) and Hayward et al. (1976) although, Peterson (1969), Robbins et al. (1966) and Udvardy and Rayfield (1977) were also used.

Holden (1973), Bailey et al. (1970), Eddy (1969) and Sigler and Miller (1963) were consulted for preparation of the list of fishes.

The status of reptiles and amphibians was determined through discussion with local herpetologists. The phylogentic listing is after Stebbins (1966). Tanner (1975) was consulted for species inhabiting Utah.

The following code letters are given for each species to describe its status.

- K Status unknown - It is believed that these species are present, but little is known of the population dynamics.
- C Common - These species are widespread and abundant.
- U Uncommon - These species are widespread, but not abundant.
- R Rare - These species are seldom identified during any one year.
- O Occasional - These species are periodically identified during a long term period—10-50 years.
- A Accidental - Distribution for these species does not normally include this area. Sightings are as far between as 50 to 100 years.
- E Endangered - These species are endangered with extinction or extirpation from wildland in Utah.
- T Threatened - These species are threatened with becoming endangered in Utah
- L Limited - These species are common but restricted to a particular use area or habitat type in Utah.

- X Extirpated - These species have disappeared from wildland habitats in Utah.
- P Protected - These species are protected by State or Federal laws in Utah.
- N Nonprotected - These species are not protected by any laws in Utah.

The following terminology is used to describe the seasonal status for avian species.

Transient - These species pass through southeastern Utah twice a year during their migratory travels.

Resident - These species occur yearlong in southeastern Utah.

Summer Resident - These species breed in southeastern Utah and migrate elsewhere for the winter.

Winter Resident - These species breed elsewhere but winter in southeastern Utah.

NOTE: The species marked with an asteric (*) are of high interest to the State and those marked with an exclamation mark (!) have potential to inhabit the environs of the project area.

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Fishes — 38 species in southeastern Utah				
Family Clupeidae				
Threadfin Shad (<u>Dorosoma petenense</u>)	E,F	L-P	Stable	Lake-pelagic areas
Family Salmonidae				
!* Cutthroat Trout (<u>Salmo clarki</u>)	A,B,D,F	C-P	Stable	Lakes-rocky shores, deep pelagic water; river-pools, riffles, and overhanging banks
!* Rainbow Trout (<u>Salmo gairdneri</u>)	A,B,E,F	C-P	Stable	Lake-littoral and pelagic areas, rivers-pools, riffles, overhanging banks
!* Brown Trout (<u>Salmo Trutta</u>)	A,B,E,F	C-P	Stable	Lake-pelagic and littoral areas, rivers-pools, riffles, and overhanging banks
*Brook Trout (<u>Salvelinus fontinalis</u>)	A,F	L-P	Stable	Lake-pelagic and littoral areas
Family Esocidae				
*Northern Pike (<u>Esox lucius</u>)	E,F	L-P	Unknown	Lake-littoral areas with submerged trees and brush
Family Cyprinidae				
Longfin Dace (<u>Agosia chrysogaster</u>)	E,F	K-P	Unknown	Unknown

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Subject:

!* Carp (<u>Cyprinus carpio</u>)	A,B,C,D,E,F	C-P	Stable	Lakes-littoral areas; quiet water areas in rivers, ponds, sloughs, creeks, and irrigation ditches
Utah Chub (<u>Gila atraria</u>)	A,B	L-P	Abundant	Irrigation ditches, ponds, sloughs, creeks, rivers and lakes
*Leatherside Chub (<u>Gila copei</u>)	A,E	C-P	Stable	Pool and riffle areas
*Humpback Chub (<u>Gila cypha</u>)	B	E-P	Decreasing	Eddies and backwaters
*Bonytail Chub (<u>Gila elegans</u>)	B,C,F	E-P	Decreasing	Main channels of large rivers
Roundtail Chub (<u>Gila robusta</u>)	B,C,D,E,F	C-P	Stable	Riffles and stagnant backwaters
Red Shiner (<u>Notropis lutrensis</u>)	B,C,D,E,F	C-P	Increasing	Riffles, pools, backwaters, and eddies
San Shiner (<u>Notropis stramineus</u>)	F	C-P	Increasing	Riffles, pools, backwaters, and eddies
Fathead Minnow (<u>Pimephales promelas</u>)	B,C,D,E,F	C-P	Stable	Pools and backwaters
*Colorado Squawfish (<u>Ptychocheilus lucius</u>)	B,C,D,E,F	E-P	Decreasing	Slow waters, eddies, backwaters, and large pools

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Subject:

*Longnose Dace (<u>Phinichtys cataractae</u>)	A	R-P	Unknown	Pools and riffles
!Speckled Dace (<u>Rhinichtys osculus</u>)	A,B,C,D,E,F	C-P	Stable	Pools and riffles
Redside Shiner (<u>Richardsonius balteatus</u>)	A,B,D	C-P	Stable	Lakes, creeks and rivers
Family Catostomidae				
White Sucker (<u>Catostomus commersoni</u>)	E,F	U-P	Unknown	Unknown
Bluehead Sucker (<u>Catostomus discobolus</u>)	A,B,C,D,E,F	C-P	Unknown	Pools, riffles and lakes
Flannelmouth Sucker (<u>Catostomus latipinnis</u>)	B,C,D,E,F	C-P	Stable	Pools and riffles
!Mountain Sucker (<u>Catostomus platyrhynchus</u>)	A	L-P	Stable	Pools and riffles
*Humpback Sucker (<u>Xyrauchen texanus</u>)	B,C,D,E,F	R-P	Decreasing	Large rivers with strong currents
Family Ictaluridae				
*Black Bullhead (<u>Ictalurus melas</u>)	B,C,D,E,F	C-P	Stable	Pools, quiet water and lakes
*Yellow Bullhead (<u>Ictalurus natalis</u>)	E, F	R-P	Stable	Quiet water areas and lakes
*Channel Catfish (<u>Ictalurus punctatus</u>)	B,C,D,E,F	C-P	Stable	Pools, riffles, quiet water areas and lakes
Family Cyprinodontidae				
Plains Killifish (<u>Fundulus kansae</u>)	F	R-P	Stable	Quiet water areas

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Subject:

Family Poeciliidae Mosquito fish (<u>Cambusia affinis</u>)	F	R-P	Stable	Quiet water areas
Family Cottidae !*Mottled Sculpin (<u>Cottus bairdi</u>)	A	C-P	Stable	Rocky riffles and pool areas
Family Percichthyidae *Stripped Bass (<u>Morone saxatilis</u>)	E,F	C-P	Increasing	Lake-pelagic areas
Family Centrarchidae Green Sunfish (<u>Lepomis cyanellus</u>)	B,C,D,E,F	C-P	Stable	Quiet backwaters and lakes
*Bluegill (<u>Lepomis macrochirus</u>)	E,F	C-P	Stable	Lakes-littoral areas with rocky shores and submerged brush
*Largemouth Bass <u>Micropterus salmoides</u>)	A,B,C,D,E,F	C-P	Stable	Rivers-quiet water areas; lakes-littoral rock areas, with submerged brush
*Black Crappie <u>Pomoxis nigromaculatus</u>)	E,F	C-P	Stable	Lake-littoral zone around submerged brush and trees, and pelagic areas
Family Percidae *Perch (<u>Perca flavescens</u>)	F	U-P	Unknown	Unknown
*Walleye (<u>Stizostedion vitreum</u>)	E,F	C-P	Stable	Lake-deep water around rocky bottom

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Subject:

Amphibians — 11 species in southeastern Utah

Family Ambystomatidae

! *Tiger Salamander (Ambystoma tigrinum) A,B,C,D,E,F

D-P

Unknown

Quiet water of ponds, reservoirs, lakes, temporary rain pools and streams from arid sagebrush plains to rolling grasslands, mountain meadows and forests

Family Pelobatidae

! Great Basin Spadefoot Toad
(Scaphiopus intermontanus)

A,B,C,D,E,F

C-P

Unknown

Sagebrush flats, pinion-juniper woodlands to high elevations in spruce-fir communities

Western Spadefoot Toad
(Scaphiopus hammondi)

F

K-P

Unknown

Washes, alkali flats, foothills, mountain valleys, in open vegetation and shortgrass, where soil is sandy and/or gravelly

Family Bufonidae

! Western Toad (Bufo boreas)

A

K-P

Unknown

Desert streams, springs, grasslands, woodlands, and mountain meadows

Red Spotted Toad (Bufo punctatus)

D,E,F

C-P

Unknown

Open grassland and rocky canyons

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Subject:

!Woodhouse's Toad (<u>Bufo Woodhousei</u>)	A,B,C,D,E,F	C-P	Unknown	Grassland, sagebrush flats, woods, desert streams, valleys, flood plains, farms, and city backyards
Great Plains Toad (<u>Bufo cognatus</u>)	C,D,E,F	C-P	Unknown	Prairies, deserts, quiet water of streams, grasslands and sagebrush plains
Family Hylidae				
!Chorus Frog (<u>Pseudaeris triseriata</u>)	A,B,C,D,F	C-P	Unknown	Grassy pools, lakes, and marshes of prairies or mountains
Canyon Tree Frog (<u>Hyla arenicolor</u>)	E,F	L-P	Unknown	Intermittant or permanent streams with rocky pools in canyons with cottonwoods or other trees
Family Ranidae				
*Bullfrog (<u>Rana catesbeina</u>)	F	L-P	Declining	Colorado River-usually quiet water where there is thick growth of aquatic vegetation
!Leopard Frog (<u>Rana pipiens</u>)	A,B,C,D,E,F	C-P	Unknown	Springs, creeks, rivers, ponds, canals, reservoirs and wet meadows

Reptiles — 36 species in southeastern Utah
Family Iguanidae

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Subject:

*Chuckwalla (<u>Sauromalus obesus</u>)	E,F	L-P	Unknown	Rocky Hillsides
!*Collared Lizard (<u>Crotaphytus collaris</u>)	A,B,C,D,E,F	C-P	Unknown	Canyons, rocky gullies, mountain slopes and boulder strewn alluvial fans where vegetation is sparse
Leopard Lizard (<u>Crotaphytus wislizenii</u>)	A,B,C,D,E,F	C-P	Unknown	Arid and semi-arid plains with bunchgrass, sagebrush or other low desert shrub communities; avoids dense vegetation
Lesser Earless Lizard (<u>Holbrookia maculata</u>)	F	K-P	Unknown	Washes, sandy stream banks and sand dunes on shortgrass prairie and farmlands
!Eastern Fence Lizard (<u>Sceloporus undulatus</u>)	A,B,C,D,E,F	C-P	Unknown	Forest, woodlands, prairie, brushy flatlands, sand dunes, rocky hillsides and farmlands
Desert Spiny Lizard (<u>Sceloporus magister</u>)	D,E,F	C-P	Unknown	Shadscale deserts, pinion- juniper woodland, willows and cottonwoods

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Subject:

!Sagebrush Lizard (<u>Sceloporus graciosus</u>)	A,B,C,D,E,F	C-P	Unknown	Variety of habitat types; sagebrush, pinion-juniper, low desert shrub and rocklands
!Tree Lizard (<u>Urosaurus ornatus</u>)	A,B,C,D,E,F	C-P	Unknown	Trees and rocks
!Side-blotched Lizard (<u>Uta Stansburiana</u>)	A,B,C,D,E,F	C-P	Unknown	Inhabits a variety of habitat types; sandy washes with scattered rocks and low growing shrubs
Desert Horned Lizard (<u>Phrynosoma platyrhinos</u>)	E	K-P	Unknown	Along washes at the edge of dunes in saltbrush and sagebrush areas
!Short-horned Lizard (<u>Phrynosoma douglassi</u>)	A,B,C,D,E,F	C-P	Unknown	Desert grassland, sagebrush, pinion-juniper, pine-spruce and spruce-fir associations, extending from desert shrub to mountain habitats
Family Xantusiidae *Utah Night Lizard (<u>Xantusia vigilis</u>)	E,F	L-P	Unknown	Dead clumps of yucca plants and woodrat middens

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Subject:

Family Teiidae Plateau Whiptail (<u>Cnemidophorus yelox</u>)	F	K-P	Unknown	Mountains in pinion-juniper woodland and lower edges of ponderosa pine forests
Western Whiptail (<u>Cnemidophorus tigris</u>)	A,B,C,D,E,F	C-P	Unknown	Desert shrub communities where plants are sparse and there are open areas for running
Family Scicidae Many-lined Skink (<u>Eumeces multivirgatus</u>)	E,F	K-P	Unknown	Shortgrass prairie that extends into the mountains; often vacant lots, city dumps and backyards
Western Skink (<u>Eumeces skiltonianus</u>)	C	K-P	Unknown	Grasslands, woodlands and forests in rocky habitat near streams with abundant cover
Family Boidae !Rubber Boa (<u>Charina bottae</u>)	A	C-P	Unknown	Grasslands, woodlands, and forests with rotting logs; often found under rocks and under the bark of fallen or standing dead trees

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Subject:

Family Colubridae

Smooth Green Snake)

(Ophedryx vernalis)

F

K-P

Unknown

Damp grassy environment

!Striped Whipsnake

(Masticophis taeniatus)

A,B,C,D,E,F

C-P

Unknown

Brushlands, grasslands,
sagebrush flats, pinion-
juniper woodlands and open
pin forests

Coachwhip (Masticophis flagellum)

E,F

K-P

Unknown

Utilizes a variety of
habitats but avoids dense
vegetation; roden burrows,
rocks and branches are
used

!Racer (Coluber constrictor)

A,B,C,D,E,F

C-P

Unknown

Meadows, spare brush and
forest openings with semi-
arid and moist areas;
grassy places near rocks
and logs are preferred

Corn Snake (Elaphe guttata)

F

K-P

Unknown

Stream and river bottoms,
rocky wooded hillsides,
coniferous forests, and
farmland with rodent
burrows, rocks and logs

!Ringneck Snake (Diadophis punctatus)

A

K-P

Unknown

Moist habitats usually in
the mountains or along
stream and river bottoms

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Subject:

!Gopher Snake (<u>Pituophis melanoleucus</u>)	A,B,C,D,E,F	C-P	Unknown	Lowlands to high mountains including desert, coniferous forest and farmland types; grassland and open brushland are prescribed
!*Milk Snake (<u>Lampropeltis triangulum</u>)	A,B,C,F	L-P	Unknown	Variety of habitats from lowlands to mountains; rotten logs and stumps are preferred
Common Kingsnake (<u>Lampropeltis getulus</u>)	E,F	K-P	Unknown	Variety of habitats from lowlands to mountains with rock outcrops and clumps of vegetation under rotting logs or rocks
!*Sonora Mountain Kingsnake (<u>Lampropeltis pyromelana</u>)	A	L-P	Unknown	Mountains, pinion-juniper woodlands, mountain brush, coniferous forests with rocks, logs and dense clumps of vegetation
Long-nosed Snake (<u>Rhinocheilus lecontei</u>)	F	K-P	Unknown	Prairies, brushland and irrigated parts of deserts

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Subject:

!Western Terrestrial Garter Snake (<u>Thamnophis elegans</u>)	A,B,C,D,E,F	C-P	Unknown	Variety of terrestrial and aquatic habitats from lowlands to mountains
!Common Garter Snake (<u>Thamnophis sirtalis</u>)	A,F	K-P	Unknown	Variety of habitats, usually near water
Black-necked Garter Snake (<u>Thamnophis cyrtopsis</u>)	F	K-P	Unknown	Desert and grasslands
Western Black-headed Snake (<u>Tantilla planiceps</u>)	E,F	K-P	Unknown	Grasslands, woodlands and deserts; often found under rocks and logs
!Night Snake (<u>Hypsiglena torquata</u>)	A,B,C,D,E,F	C-P	Unknown	Plains, sagebrush flats, desert and woodlands; often found under rocks and surface litter
Family Crotalidae Hopi Rattlesnake (<u>Crotalus viridis nuntius</u>)	E	U-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts
Prairie Rattlesnake (<u>Crotalus viridis viridis</u>)	F	U-P	Unknown	Prefers rock piles and rodent burrows on

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Subject:

!Midget Faded Rattlesnake
Crotalus viridis concolor)

A,B,C,D,E,F

C-P

Unknown

grasslands, woodlands and
forests; avoids sparsely
vegetated deserts

Prefers rock piles and
rodent burrows on
grasslands, brushlands,
woodlands and forests;
avoids sparsely vegetated
deserts

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Subject:

Birds — 278 species in southeastern Utah

Order Gaviiformes

Family Gaviidae

Common Loon (Gavia immer)

A,B,C,D,E,F

U-P
transient and
winter resident

Stable

Lakes of coniferous
forests, open lakes,
reservoirs and bays

Order Podicipediformes

Family Podicipedidae

Horned Grebe (Podiceps auritus)

A,B,C,D,E,F

R-P
transient and
summer resident

Stable

Lakes, ponds and
reservoirs

Eared Grebe (Podiceps nigricollis)

A,B,C,D,E,F

C-P
summer resident

Stable

Lakes, bays and
reservoirs

*Western Grebe

(Aechmophorus occidentalis)

A,B,C,D,E,F

K-P
summer resident

Unknown

Sloughs, bays and
reservoirs and lakes
with emergent vege-
tation for nesting

Pied-billed Grebe

(Podilymbus podiceps)

A,B,C,D,E,F

C-P
summer resident

Stable

Ponds, lakes
streams and marshes

Order Pelecaniformes

Family Pelecanidae

*White Pelican

(Pelecanus erythrorhynchos)

A,B,C,D,E,F

L-P
transient and
summer resident

Stable

Larger shallow
bodies of water
and large rivers

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Subject:

Family Phalacrocoracidae *Double-crested Cormorant (<u>Phalacrocorax auritus</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Bays, lakes and rivers
Order Ciconiiformes Family Ardeidae !*Great Blue Heron (<u>Ardea herodias</u>)	A,B,C,D,E,F	K-P resident	Unknown	Marshes, shallow reservoirs, rivers streams, shores and irrigation ditches
Green Heron (<u>Butorides striatus</u>)	B,E,F	R-P transient	Unknown	Marshes, wooded streams, rivers, small ponds and lake margins
Cattle Egret (<u>Bubulcus ibis</u>)	E,F	O-P transient	Unknown	Marshes, lake margins and irrigated lands
Snowy Egret (<u>Egretta thula</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, ponds, lake margins and irrigated land
Black-crowned Night Heron (<u>Nycticorax nycticorax</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, lake margins and shores
Least Bittern (<u>Ixobrychus exilis</u>)	D,E,F,	U-P transient	Unknown	Densely vegetated marshes

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Subject:

American Bittern (<u>Botaurus lentiginosus</u>)	A,B,C,D,E,F	U-P summer resident	Stable	Densely vegetated marshes
Family Ciconiidae Wood stork (<u>Mycteria americana</u>)	D,E,F	O-P transient	Unknown	Marshes, ponds and lake margins
Family Threskiornithidae *White-faced Ibis (<u>Plegadis chihi</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Marshes and irrigated land
Order Anseriformes Family Anatidae *Whistling Swan (<u>Olor columbianus</u>)	A,B,C,D,E,F	O-P winter resident C-P transient	Stable	Lakes, large rivers and fields
*Trumpeter Swan (<u>Olor buccinator</u>)	B,C,D,E,F	R-P transient	Unknown	Lakes and large rivers
*Canada Goose (<u>Branta canadensis</u>)	A,B,C,D,E,F	C-P resident and transient	Increasing	Lakes, bays, marshes, rivers and grain- fields
*White-fronted Goose (<u>Anser albifrons</u>)	A,B,C,D,E,F	R-P transient	Stable	Marshes, fields, lakes and bays
*Snow Goose (<u>Chen caerulescens</u>)	A,B,C,D,E,F	U-P transient	Stable	Marshes, grainfields, reservoirs, ponds and bays

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Subject:

*Ross' Goose (<u>Chen rossii</u>)	A,B,C,D,E,F	O-P transient	Stable	Marshes, grainfields, prairies, ponds and bays
!*Mallard (<u>Anas platyrhynchos</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, grainfields ponds, rivers, lakes bays and reservoirs extending from lowlands to mountains
!*Gadwall (<u>Anas strepera</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Lakes, ponds, rivers and marshes
!*Pintail (<u>Anas acuta</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, grainfields, ponds, lakes and reservoirs
*Green-winged Teal (<u>Anas crecca</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, lakes, ponds rivers and bays
*Blue-winged Teal (<u>Anas discors</u>)	A,B,C,D,E,F	U-P resident and transient	Stable	Ponds and marshes
!*Cinnamon Teal (<u>Anas cyanoptera</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Stock ponds, rivers marshes and lakes
*American Widgeon (<u>Anas americana</u>)	A,B,C,D,E,F	C-P resident and	Stable	Marshes, irrigated land, ponds, lakes

Subject:

		transient		and bays
*Northern Shoveler (<u>Anas Clypeata</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds and sloughs
*Wood Duck (<u>Aix sponsa</u>)	A,B,C,D,E,F	R-P transient	Stable	Wood rivers and ponds
*Redhead (<u>Aythya americana</u>)	A,B,C,D,E,F	C-P transient and transient	Stable	Marshes with some deep water, lakes and reservoirs
*Ring-necked Duck (<u>Aythya collaris</u>)	A,B,C,D,E,F	U-P transient	Stable	Coniferous lakes, wood ponds, marshes and reservoirs
*Canvasback (<u>Aythya yallisineria</u>)	A,B,C,D,E,F	C-P Transient R-P summer resident	Stable	Marshes, lakes and reservoirs
*Greater Scaup (<u>Aythya marila</u>)	A,B,C,D,E,F	U-P transient	Stable	Lakes, rivers and ponds
*Lesser Scaup (<u>Aythya affinis</u>)	A,B,C,D,E,F	C-P transient	Stable	Marshes, ponds and lakes
*Common Goldeneye (<u>Bucephala clangula</u>)	A,B,C,D,E,F	U-P transient	Stable	Lakes and rivers

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Subject:

*Bufflehead (<u>Bucephala albeola</u>)	A,B,C,D,E,F	U-P transient	Stable	Lakes, ponds and rivers
*White-winged Scoter (<u>Melanitta deglandi</u>)	D	O-P transient	Stable	Large lakes and reservoirs. Recorded occurrence at Desert Lake WMA
*Ruddy Duck (<u>Oxyura iamaicensis</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds, rivers and reservoirs
*Hooded Merganser (<u>Mergus cucullatus</u>)	A,B,C,D,E,F	R-P transient	Stable	Wood lakes, ponds rivers and reservoirs
*Common Merganser (<u>Mergus merganser</u>)	A,B,C,D,E,F	C-P transient U-P winter resident	Stable	Wooded lakes and rivers in summer; in winter, open rivers, lakes lakes and ponds
*Red-breasted Merganser (<u>Mergus serrator</u>)	A,B,C,D,E,F	C-P transient	Stable	Lakes, reservoirs and rivers
Order Falconiformes Family Cathartidae !* Turkey Vulture (<u>Cathartes aura</u>)	A,B,c,D,e,f	C-P summer resident	Stable	Usually seen in sky or perched on dead tress, posts, carrion or on ground

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Subject:

!California Condor (<u>Gymnogyps californianus</u>)	A,B,C,D,E,F	X-P	Extirpated	Usually seen in sky or perched on dead tress, posts, carrion or on ground
Family Accipitridae				
!*Goshawk (<u>Accipiter gentilis</u>)	A,B,C,D,E,F	U-P resident	Stable	Mountain woodlands
!*Sharp-shinned Hawk (<u>Accipiter striatus</u>)	A,B,C,D,E,F	U-P resident and transient	Stable	Forests, thickets scruboak, desert riparian, mountain woodlands and aspen
!*Cooper's Hawk (<u>Accipiter cooperii</u>)	A,B,C,D,E,F	C-P summer resident and transient R-P winter resident	Stable	Broken woodlands dry wooded canyons, riparian areas, pinion- juniper and conifers
!*Red-tailed Hawk (<u>buteo jamaicensis</u>)	A,B,C,D,E,F	C-P resident	Stable	Open country, wood- lands, mountains and deserts
!*Red-shouldered Hawk (<u>Buteo lineatus</u>)	C,F	A-P transient	Unknown	Broken woodlands, primarily along low- land rivers and often close to cultivated fields

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Subject:

!*Swainson's Hawk (<u>Buteo swainsoni</u>)	A,B,C,D,E,F	U-P summer resident	Stable	Dry plains and rangeland with hills; open forest or alpine meadows with sparse trees
*Rough-legged Hawk	A,B,C,D,E,F	C-P winter resident	Stable	Open country, woodlands, deserts and marshes
*Ferruginous Hawk (<u>Buteo regalis</u>)	A,B,C,D,E,F	U-P Summer resident R-P Winter resident	Stable	Open desert; infrequent marshes & farmlands are utilized
!*Golden Eagle (<u>Aquila chrysaetos</u>)	A,B,C,D,E,F	C-P resident	Stable	Open mountains foothills, canyons and deserts
!*Bald Eagle (<u>Haliaeetus leucocephalus</u>)	A,B,C,D,E,F	E-P winter resident	Increasing	Lakes, rivers and marshes surrounded by open country with available perching sites
!*Marsh Hawk (<u>Circus cyaneus</u>)	A,B,C,D,E,F,	C-P resident	Stable	Marshes, fields and prairies
Family Pandionidae *Osprey (<u>Pandion haliaetus</u>)	A,B,C,D,E,F	U-P transient	Stable	Rivers, Lakes and large bodies of water
Family Falconidae !*Prairie Falcon				

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Subject:

(<u>Falco mexicanus</u>)	A,B,C,D,E,F	C-P resident	Stable	Canyons, open habitat in mountains, plains and deserts
!*Peregrine Falcon (<u>Falco peregrinus</u>)	A,B,C,D,E,F	E-P resident	Unknown	Canyons, high cliffs, rivers, marshlands and deserts
*Merlin (<u>Falco columbarius</u>)	A,B,C,D,E,F	K-P winter resident	Unknown	Open country and foot hills; often associated with flocking passerine
!*American Kestrel (<u>Falco Sparverius</u>)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Stable	Open country, prairies, deserts, wooded streams, farmland and cities
Order Calliformes				
Family Tetraonidae				
!*Blue Grouse (<u>Dendragapus obscurus</u>)	A,B,C,D,E,F	C-P resident	Stable	Coniferous forests, aspen, mountain brush, open slash and burns
!*Ruffed Grouse (<u>Bonasa umbellus</u>)	A,B	C-P resident	Stable	Aspen and coniferous forests near stream courses
Sage Grouse (<u>Centrocercus urophasianus</u>)	A,B,C,F	C-P resident	Stable	Sagebrush plains associated with pasture

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Subject:

				lands; sagebrush parks associated with wet meadows
Family Phasianidae				
! *California Quail (<u>Lophortyx californicus</u>)	A,B,D,E,F	C-P resident	Stable	Mountain brush, woodland edges and farmlands near river bottoms
*Gambels Quail (<u>Lophortyx gambelii</u>)	D,E,F	C-P resident	Stable	Desert thickets, usually near water
! *Chukar (<u>Alectoris chukar</u>)	A,B,C,D,E,F	C-P resident	Stable	Rocky, grassy or brushy slopes in arid mountains and canyons
*Ring-necked Pheasant (<u>Phasianus colchicus</u>)	A,B,C,D,E,F	C-P resident	Decreasing	Irrigated cropland, pastureland, wetlands
*White-winged Pheasant (<u>Phasianus colchicus</u>)	E,F	L-P resident	Decreasing	Irrigated cropland, pastureland and wetland: near Hanksville and Bluff, Utah
Family Meleagrididae				
*Merriam's Turkey (<u>Meleagris gallapavo</u>)	F	L-P resident	Stable	Mountainous regions with Ponderosa pine, mixed conifer and aspen woodlands or mountain brush

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Subject:

Order Gruiformes				
Family Gruidae				
Sandhill Crane (<u>Crus canadensis</u>)	A,B,C,D,E,F	L-P transient	Stable	In winter, prairies grainfields and marshes in summer, mountain meadows and marshes
Family Rallidae				
*Virginia Rail (<u>Rallus limicola</u>)	A,B,C,D,E,F	C-P resident	Stable	Marshes
*Sora Rail (<u>Porzana carolina</u>)	A,B,C,D,E,F	U-P resident	Stable	Marshes and wet meadows
*Common Gallinule (<u>Gallinula chloropus</u>)	A,D	R-P transient	Unknown	Marshes, wet meadows, flakes with bulrush or cattails and sedges
*American Coot (<u>Fulica americana</u>)	A,B,C,D,E,F	C-P resident and transient	Stable	Ponds, lakes, marshes, and agricultural lands adjacent to wetland habitats.
Order Charadriiformes				
Family Charadriidae				
Semipalmated Plover (<u>Charadrius semipalmatus</u>)	A,B,C,D,E,F	U-P transient	Stable	Shores of marshes, reservoirs and mudflats
Snowy Plover (<u>Charadrius alexandrinus</u>)	A,B,C,D,E,F	R-P	Unknown	Alkali and sand flats

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Subject:

		transient		
!Killdeer (<u>Charadrius vociferus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Fields and pastures, lawns, riverbanks, irrigated land, shores, plowed fields, alkali flats and gravel roads
!Mountain Plover (<u>Charadrius montanus</u>)	A,B,C,F	R-P transient	Stable	Semi-arid grasslands, plains and plateaus
American Golden Plover (<u>Pluvialis dominica</u>)	A,B,C,D,E,F	U-P transient	Stable	Prairies, mudflats and shores
Black-bellied Plover <u>Pluvialis squatarola</u>)	A,B,C,D,E,F	C-P transient	Stable	Mudflats, open marshes and shores
Family Scolopacidae *Common Snipe (<u>Capella gallinago</u>)	A,B,C,D,E,F	C-P resident	Stable	Marshes, irrigation ditches, stream sides, and wet meadows
*Long-billed Curlew <u>Numenius americanus</u>)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Meadows, pastures and wetlands
*Willet (<u>Catoptrophorus semipalmatus</u>)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Marshes, wet meadows and muddy shores

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Subject:

!Spotted Sandpiper (<u>Tringa macularia</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Pebbly lake shores, ponds and stream sides
!Solitary Sandpiper (<u>Tringa solitaria</u>)	A,B,C,D,E,F	U-P transient	Stable	Stream sides, ponds and marshes
Greater Yellowlegs (<u>Tringa melanoleuca</u>)	A,B,C,D,E,F	U-P transient	Stable	Open marshes, mudflats, streams and ponds
Lesser Yellowlegs (<u>Tringa flavipes</u>)	A,B,C,D,E,F	C-P transient	Stable	Marshes, mudflats, shores and pond edges
Pectoral Sandpiper (<u>Calidris melanotos</u>)	A,B,C,D,E,F	U-P transient	Stable	Prairie pools and marshy shores
Baird's Sandpiper (<u>Calidris bairdii</u>)	A,B,C,D,E,F	U-P transient	Stable	Rainpools, pond margins mudflats and shores
Least Sandpiper (<u>Calidris minutilla</u>)	A,B,C,D,E,F	C-P transient	Stable	Grassy marshes, rain- pools, shores and alkali mudflats
Western Sandpiper (<u>Calidris mauri</u>)	A,B,C,D,E,f	C-P transient	Stable	Shores, beaches, mud- flats and open marshes

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Subject:

Sanderling (<u>Calidris alba</u>)	A,B,C,D,E,F	U-P transient	Stable	Lake shores
Short-billed dowitcher (<u>Limnodromus griseus</u>)	A,B,C,D,E,F	U-P summer resident and transient	Stable	Mudflats, open marshes and ponds
Long-billed Dowitcher (<u>Limnodromous scolopaceus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Mudflats, shallow pools and wetlands
Marbled Godwit (<u>Limosa fedoa</u>)	A,B,C,D,E,F	C-P transient	Stable	Grasslands and meadows near lakes and shallow lake margins
Family Recurvirostridae American Avocet (<u>Recurvirostra americana</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, mudflats, alkaline lakes, shallow ponds and sloughs
Black-necked Stilt (<u>Himantopus mexicanus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Grassy marshes, alkali mudflats, pools and shallow lake
Family Phalaropodidae Wilson's Phalarope (<u>Phalaropus tricolor</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Shallow lakes, marshes pools, shores and

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Subject:

		and transient		mudflats
Northern Phalarope (<u>Phalaropus lobatus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Lakes and ponds
Family Laridae				
Glaucous Gull (<u>Larus hyperboreus</u>)	D	R-P transient	Stable	Recorded using marsh- lands at Desert Lake WMA
Herring Gull (<u>Larus argentatus</u>)	A,B,C,D,E,F	U-P transient	Stable	Lakes, farmlands and dumps
California Gull (<u>Larus californicus</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, rivers, farm- lands and dumps
Ring-billed Gull (<u>Larus delawarensis</u>)	A,B,C,D,E,F	C-P winter resident	Stable	Lakes, rivers, refuse dumps, fields and cities
Franklin's Gull (<u>Larus pipixcan</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Prairies, marshes, lakes and plowed fields
Bonaparte's Gull (<u>Larus philidelphia</u>)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and open marshes
Forsters Tern (<u>Sterna forsteri</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs

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Subject:

Common Tern (<u>Sterna hirundo</u>)	A,B,C,D,E,F	U-P transient	Stable	Lakes and reservoirs
Black Tern (<u>Chlidonias niger</u>)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Caspian Tern (<u>Hydroprogne caspia</u>)	A,B,C,D,E,F	U-P transient	Stable	Large lakes and reservoirs

Order Columbiformes

Family Columbidae

!*Band-tailed pigeon
(Columba fasciata)

A,E,F	U-P summer resident and transient	Stable	Forests, canyons and foothills near mountain brush (acorns) and agricultural lands
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!*Rock Dove (Columba lavia)

A,B,C,D,E,F	C-N resident	Stable	Cities, farms and cliffs
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!*Mourning Dove (Zenaida macroura)

A,B,C,D,E,F	C-P summer resident and transient	Stable	Farmlands, towns, open woods, grassland and deserts
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White-winged Dove
(Zenaidura asiatica)

E,F	A-P summer resident and transient	Unknown	Open woods and river bottoms
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Order Cuculiformes

Family Cuculidae

!*Yellow-billed Cuckoo

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Subject:

(Coccyzus americanus)

A,B,C,D,E,F,

K-P
summer resident

Unknown

River thickets and
willows

Order Strigiformes

Family Tytonidae

!*Barn Owl (Tyto alba)

A,B,C,D,E,F

K-P
resident

Unknown

Woodlands, fields, farms,
towns, canyons, cliffs and
dirt banks

Family Strigidae

!*Screech Owl (Otus asio)

A,B,C,D,E,F

U-P
resident

Stable

Riparian communities and
wooded canyons

!*Flammulated Owl (Otus flammeolus)

A,B,C,D,E,F

K-P
summer resident

Unknown

Open pine and fir
forests in mountains

!*Great Horned Owl (Bubo virginianus)

A,B,C,D,E,F

C-P
resident

Stable

Ubiquitous

!*Pygmy Owl (Glaucidium gnoma)

A,B,C,D,E,F

K-P
resident

Unknown

Wooded canyons in open
coniferous, mixed wood-
lands and pinion-juniper
forests

*Burrowing Owl (Speotyto cunicularia)

A,B,C,D,E,F

L-P
resident

Declining

Open grassland, prairies,
dikes, desert, farms and
prairie dog colonies

*Spotted Owl (Strix occidentalis)

C,E

L-P
Unknown

Unknown

Wooded canyons with
narrow side canyon in
the desert

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Subject:

!*Long-eared owl (<u>Asio otus</u>)	A,B,C,D,E,F	C-P resident	Stable	River woodlands, pinion-juniper forests, willow thickets and Russian olive trees
*Short-eared Owl (<u>Asio flammeus</u>)	A,B,C,D,E,F	C-P resident	Stable	Marshes, prairies irrigated land and open country with short vegetation
!*Saw-whet Owl (<u>Aegolius acadicus</u>)	A,B,C,D,E,F	K-P resident	Stable	Forest, conifers and groves
Order Caprimulgiformes Family Caprimulgidae !Common Nighthawk (<u>Chordeiles minor</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Treeless plains to mountains with open pine woods; often seen in flight over country site
Lesser Nighthawk (<u>Chordeiles acutipennis</u>)	E	R-P summer resident	Unknown	Arid open scrub, dry grasslands, pastures and desert washes
!Poor-will (<u>Phalaenoptilus nuttallii</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Arid uplands with open pinion-juniper and sparse brush; riparian areas, roadsides

Order Apodiformes
Family Apodidae

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Subject:

! *Black Swift (<u>Cypseloides niger</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Open areas in mountain country
d! White-throated Swift (<u>Aeronautes saxatalis</u>)	A,B,C,D,F	C-P summer resident	Unknown	Open areas; Wide ranging and breeds mainly in dry mountain canyons
Family Trochilidae				
! Black-chinned Hummingbird (<u>Archilochus alexandri</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Semi-arid country near water; semi-wooded canyons and slopes, mountain brush and riparian woodlands
! Broad-tailed Hummingbird (<u>Selasphorus platycercus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Ubiquitous
! Rufous Hummingbird (<u>Selasphorus rufus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Forest edges, thickets in coniferous and deciduous forests, mountain brush and alpine meadows
! Calliope Hummingbird (<u>Stellula calliope</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	High mountains, canyons and forest openings
Rivoli's Hummingbird (<u>Eugens fulgens</u>)	E,F	U-P summer resident	Unknown	High mountain forest openings, pine-oak

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Subject:

forests and canyons

Order Caracilformes

Family Alcedinidae

!*Belted Kingfisher

(Megaceryle alcyon)

A,B,C,D,E,F

K-P
resident

Unknown

Rivers, ponds and lakes

Order Piciformes

Family Picidae

!Common Flicker

(Colaptes auratus)

A,B,C,D,E,F

C-P
resident

Stable

Deciduous or mixed wood-
lands, open forest, farms
towns, canyons and semi-
open country

*Pileated woodpecker

(Dryocopus pileatus)

F
6

K-P
resident

Unknow

Mature coniferous and
mixed forests with many
snags

!Red-headed Woodpecker

(Melanerpes erythrocephalus)

B

R-P
resident

Unknown

Groves, farm country,
riparian areas, towns and
scattered trees

!Yellow-bellied Sapsucker

(Sphyrapicus varius)

A,B,C,D,E,F

C-P
resident

Unknown

In summer woodlands and
aspen groves; in winter
orchards and other trees

*Lewis Woodpecker (<u>Asyndesmus lewis</u>)	F	K-P summer resident and transient	Unknown	Scattered or logged forests, burns, cotton- wood groves and ponderosa pine
!Hairy Woodpecker (<u>Dendrocopos villosus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Mountain forests, woodlands and river groves
!Downy Woodpecker (<u>Dendrocopos pubescens</u>)	A,B,C,D,E,F	C-P resident	Unknown	Broken or mixed forest, willows, poplars, riparian woodlands, orchards and shade trees
!Northern Three-toed Woodpecker (<u>Picoides tridactylus</u>)	A,B,C,E,F	U-P resident	Unknown	Coniferous forests
Order Passeriformes Family Tyrannidae Western Kingbird (<u>Tyrannus verticalis</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Open country with scattered trees, farms and roadsides
!Cassin's Kingbird (<u>Tyrannus vociferans</u>)	A,B,C,D,E,F,	U-P summer resident	Unknown	Semi-open high country scattered trees, pine- oak mountains and ranch groves

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Subject:

Eastern Kingbird (<u>Tyrannus tyrannus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Wood edges, parklands, riparian areas, farms, shelter belts, orchards and roadsides
!Ash-throated Flycatcher (<u>Myiarchus cinerascens</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Semi-arid country, deserts, brush, pinion- juniper and open woods
Black Phoebe (<u>Sayornis nigricans</u>)	F	C-P resident	Unknown	Streamside woodlands farm yards and towns with cliffs near water
Says Phoebe (<u>Sayornis saya</u>)	A,B,C,D,E,F,	C-P resident	Unknown	Open arid country, deserts, bushy plains, prairie farms, canyon
!Willow (Traill's) Flycatcher (<u>Empidonax traillii</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in willow thickets in low valleys, along canyons or in high mountain meadows
!Hammond's Flycatcher (<u>Empidonax hammondi</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	High coniferous forests
!Dusky Flycatcher (<u>Empidonax oberholseri</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in mountain brush with a scattering of trees
!Gray Flycatcher (<u>Empidonax wrightii</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Breeds in sagebrush and pinion-juniper woodlands

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Subject:

!Western Flycatcher (<u>Empidonax difficilis</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Moist woods, mixed or coniferous forests, canyons, groves; must have water and shade
!Western Wood Peewee (<u>contipus sordidulus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands, pine-oak forests, open conifers and rivergroves
!Olive-sided Flycatcher (<u>Contopus borealis</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Coniferous forests, burns and clearings; in migration habitats used as varied; usually seen on tip of dead tree or branch
Family Alaudidae !Horned Lark (<u>Eremophila alpestris</u>)	A,B,C,D,E,F	C-P resident	Unknown	Plains, desert, prairies, fields, sparse sagebrush flats, dirt roads, shores, alpine meadow, alkali flats and areas of sparse vegetation
Family Hirundinidae !Violet-green Swallow (<u>Tachycineta thalassina</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Widespread when foraging; when nesting, open forests foothill woods, mountains canyons, cliffs and towns
!Tree Swallow (<u>Iridoprocne bicolor</u>)	A,B,C,D,E,F,	C-P summer resident	Unknown	Open country near water, marshes, mountain meadows, streams, lakes and wires;

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Subject:

!Bank Swallow (<u>Riparia riparia</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	when nesting requires dead trees and snags, preferably near water Usually near water; over fields, marshes, streams and lakes
!Rough-winged Swallow (<u>Stelgidopteryx ruficollis</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Near streams, lakes and washes
!Barn Swallow (<u>hirundo ruscica</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Open or semi-wooded country, farms, ranches, fields, marshes and lakes usually near man's habitation
!Cliff Swallow (<u>Petrochelidon pyrrhonota</u>)	A,B,C,D,E,F	C-P Summer resident	Unknown	Open to semi-wooded country, neat farms, cliffs, canyons, rivers or lakes
!*Purple Martin (<u>Progne subis</u>)	A,B,C,E,F	K-P summer resident	Unknown	Open forests of aspen and conifers
Family Corvidae !Steller's Jay (<u>Cyanocitta stelleri</u>)	A,B,C,D,E,F	C-P resident	Unknown	Conifers and pine-oak forests
!Gray Jay (<u>Perisoreus canadensis</u>)	A,B,C,E,F	R-P resident	Unknown	Coniferous forests
!Scrub Jay (<u>Abelocoma coerulescens</u>)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, oaks, mountain brush, river woods and pinion-juniper woodlands

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Subject:

!Black-billed Magpie (<u>Pica pica</u>)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, ranches, sage- brush, river thickets, shelterbelts and prairie brush
!Common Raven (<u>Corvus corax</u>)	A,B,C,D,E,F	C-P resident	Unknown	Mountains, deserts, canyons and cliffs
!Common Crow (<u>Corvus brachyrhynchos</u>)	A,B,C,D,E,F	O-P transient	Unknown	Deciduous, mixed and open coniferous woodlands farmlands and river groves
!Pinion Jay (<u>Gymnorhinus cyanocephala</u>)	A,B,C,D,E,F	C-P resident	Unknown	Pinion-juniper woodlands, but ranges into sagebrush
Clark's Nutcracker (<u>Nucifraga columbiana</u>)	A,B,C,E,F	C-P resident	Unknown	High mountains in conifer: near tree line
Family Paridae !Black-capped Chickadee (<u>Parus atricapillus</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer aspen-conifer, mixed woodlands and forest edges; in winter woodlands along valley streams and tree rows
!Mountain Chickadee (<u>Parus gambelli</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer mountain forests and conifers; in winter riparian wood- lands at lower elevations
!Plain Titmouse (<u>Parus inornatus</u>)	A,B,C,D,E,F	K-P resident	Unknown	Pinion-juniper woodlands

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Subject:

!Bushtit (<u>Psaltriparus minimus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Oak woodlands, mountain brush, broad-leafed and mixed woods and pinion- juniper forest
Family Sittidae				
!White-breasted Nuthatch (<u>Sitta carolinensis</u>)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, pinion-juniper wood- lands, oak brush, and riparian woodlands
!Red-breasted Nuthatch (<u>Sitta canadensis</u>)	A,B,C,E,F	C-P resident	Unknown	Coniferous forests
!Pygmy Nuthatch (<u>sitta pusilla</u>)	A,B,C,D,E,F	C-P resident	Unknown	Ponderosa pines and Douglas fir
Family Certidae				
!Brown Creeper (<u>Certhia familiaris</u>)	A,B,C,E,F	C-P resident	Unknown	In summer mature montane mixed and coniferous forests; lower elevations in winter
!Dipper (<u>Cinclus mexicanus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Fast-flowing streams in or near mountains; lower levels in winter
Family Troglodytidae				
!House Wren (<u>Troglodytes aedon</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands of mountains and valleys
!Rock Wren (<u>Salpinctes obsoletus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Desert to high mountain areas with talus slopes and cliffs

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Subject:

!Canyon Wren (<u>Catherpes mexicanus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Rocky cliffs, crevices, and rock slides
!Bewick's Wren (<u>Thryomanes bewickii</u>)	A,B,C,D,E,F	C-P resident	Unknown	Under brush and pinion- juniper woodlands
Long-billed Marsh Wren (<u>Cistothorus palustris</u>)	A,B,C,D,E,F	L-P resident	Unknown	Cattail marshes
Family Mimidae !Mockingbird (<u>Mimus polyglottos</u>)	A,B,C,D,E,F	U-P transient and summer resident	Unknown	Towns, farms, ranches, roadsides, brush and desert streamsidess
!Gray Catbird (<u>Dumetella carolinensis</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Undergrowth, brush or thickets along valley streams
Brown Thrasher (<u>Toxostoma rufum</u>)	D,E,F	R-P resident	Unknown	Brushy places and thorny thickets
Bendire's Thrasher (<u>Toxostoma bendirei</u>)	F	R-P resident	Unknown	Desert scrub and farmlands
!Sage Thrasher (<u>Oreoscoptes montanus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Sagebrush, rabbit- brush, brushy slopes and mesas
Family Muscicapidae !American Robin (<u>Turdus migratorius</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer town, lawns, farmland, open forests, streamsidess and any wooded habitat: in winter berry-

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Subject:

				bearing trees
Varied thrush (<u>Ixoreus naevius</u>)	E,F	O-P winter resident	Unknown	Deciduous and coniferous forests usually near water
!Hermit Thrush (<u>Catharus guttatus</u>)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	In summer mixed woodlands and open coniferous forest in winter woods, thickets and parks
!Swainson's Thrush (<u>Catharus ustulatus</u>)	A,B,D	C-P summer resident	Unknown	Willow thickets, river woodlands, aspens, forest undergrowth and conifers
!Veery (<u>Catharus fuscescens</u>)	A,B	U-P summer resident	Unknown	Streamside woodlands
!*Western Bluebird (<u>Stali mexicana</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Scattered trees, open conifers, forests and farms
!*Mountain Bluebird (<u>Stalia curruoides</u>)	A,B,C,D,E,F	K-P resident	Unknown	In summer open areas where mountain meadows and pastures are interspersed with loose stands or single coniferous trees; in winter lower elevations, often open areas with available perching sites
!Townsend's Solitaire (<u>Myadestes townsendi</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer open coniferous forests in the mountains; in winter canyons, brushy

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Subject:

slopes and junipers

Family Sylviidae

!Blue-gray Gnatcatcher
(Polioptila caerulea)

A,B,C,D,E,F

C-P
summer resident

Unknown

Open mixed woods, stream-
side thickets, mountain
brush and pinion-juniper
woodlands

!Golden-Crowned Kinglet
(Regulus satrapa)

A,B,C,D,E,F

U-P
Resident

Unknown

In summer coniferous
forests; in winter pinion
juniper and brush in lower
elevations

!Ruby-crowned Kinglet
(Regulus claendula)

A,B,C,D,E,F

C-P
resident

Unknown

In summer coniferous
forests; in winter other
woodlands and thickets

Family Motacillidae

!Water Pipet (Anthus spinoletta)

A,B,C,D,E,F

C-P
resident

Unknown

In summer alpine zone
in migration and winter
plains, bare fields,
shores and irrigated field

Family bombycillidae

!Bohemian Waxwing
(Bombycilla garrulus)

A,B,C,D,E,F

U-P
winter resident

Unknown

Widespread and feeds
on berries

!Cedar waxwing (Bombycilla cedrorum)

A,B,C,D,E,F

C-P
winter resident

Unknown

Open woodlands, Russian
olive and other fruiting
trees or orchards

Family Laniidae

!Northern Shrike
(Lanius excubitor)

A,B,C,D,E,F

U-P

Unknown

Semi-open country or

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Subject:

		winter resident		open country with look-out posts
Loggerhead Shrike (<u>Lanius ludovicianus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Deserts and other open country with lookout posts, wires, scattered trees and low scrub
Family Sturnidae !Starling (<u>Stuirmus vulgaris</u>)	A,B,C,D,E,F	C-P resident	Unknown	Cities, fields, orchards and woodlands
Family Vireonidae Gray Vireo (<u>Vireo vicinior</u>)	D,E,F	U-P summer resident	Unknown	Brushy mountain slopes, scrub oak and junipers
!Solitary Vireo (<u>Vireo solitarius</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Streamside woodlands, pinion-juniper and ponderosa pine forests
!Warbling Vireo (<u>Vireo gilvus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous and mixed aspen woodlands near mountain and valley streams
Family Parulidae !Orange-crowned Warbler (<u>Vermivora celata</u>)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Brushy woodland clearings, hillsides, aspens and mountain brush in migration streamside woodlands
!Nashville Warble (<u>Vermivora ruficapilla</u>)	A,B,C,D,E,F	U-P transient	Unknown	Open mixed woods with undergrowth and at forest edges

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Subject:

!Virginia's Warbler <u>Vermivora virginiae</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Oak canyons, brushy slopes and pinion- juniper brushland
Lucy's Warbler (<u>Vermivora luciae</u>)	E,F	U-P summer resident	Unknown	Along desert streams in willows and cottonwoods
!Yellow Warbler (<u>Dendrocia petechia</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Willows, aspens, stream- side trees and shrubs or town shade trees
*Grace's Warbler (<u>Dendrocia graciae</u>)	E,F	U-P summer resident	Unknown	Ponderosa pine-oakbrush communities of the mountains
!Magnolia Warbler (<u>Dendrocia magnolia</u>)	A,B,C,D,E,F,	U-P transient	Unknown	Coniferous forests
Hermit Warbler (<u>Dendroica occidentalis</u>)	E,F	U-P summer resident and transient	Unknown	Coniferous forests; in migration other trees
!Yellow-rumped Warbler (<u>Denrocia coronata</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	In summer coniferous and mixed forests; in winter varied woods, river thickets, brush and gardens
!Black-throated Gray Warbler (<u>Dendroica nigrescens</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	In summer dry oak slopes, pinion-juniper woodlands, open mixed woods; in migration varied trees and brush

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Subject:

!Townsend's Warbler
(Dendroica townsendi)

A,B,C,D,E,F

U-P
transient

Unknown

Coniferous forests

Northern Waterthrush
(Seiurus noveboracensis)

B,C,D,E,F

U-P
transient

Unknown

Swampy or wet woods,
streamsides and lake-
shores; in migration
thickets

MacGillivray's Warbler
(Oporornis tolmiei)

A,B,C,D,E,F

C-P
summer resident

Unknown

Low dense undergrowth
and shady, damp thickets

Yellowthroat
(Geothlypis trichas)

A,B,C,D,E,F

L-P
summer resident

Unknown

Cattail and bulrush
marshes, willow thickets
and streamsides

Yellow-breasted Chat
(Icteria virens)

A,B,C,D,E,F

C-P
summer resident

Unknown

Dense brush along
water courses, willow
thickets and moist

!Wilson's Warbler
(Wilsonia pusilla)

A,B,C,D,E,F

C-P
summer resident

Unknown

Deciduous shrubbery or
thickets, streamside
growth, willows and fir
thickets in the mountains

!American Redstart
(Setophaga ruticilla)

A,B,C

U-P
transient

Unknown

Open secondary deciduous
woodlands and riparian
woodlands

Family Ploceidae

!House Sparrow
(Passer domesticus)

A,B,C,D,E

C-P

Unknown

Cities, farms & uses

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Subject:

resident

Family Icteridae

Western Meadowlark
(Sturnella neglecta)

A,B,C,D,E,F

C-P
resident

Unknown

Open fields, meadows
and plains

Yellow-headed Blackbird
(Xanthocephalus xanthocephalus)

A,B,C,D,E,F

C-P
summer resident

Unknown

Marshes with cattail
and bulrushes; forages
in fields and open
country

Red-winged Blackbird
(Agelaius phoeniceus)

A,B,C,D,E,F

C-P
resident

Unknown

Breeds in marshes
with emergent aquatic
vegetation, forages in
cultivated land and at
the edge of water

!Northern Oriole
(Icterus galbula)

A,B,C,D,E,F

C-P
summer resident

Unknown

Open woodlands, cotton-
woods or other shade
trees and riparian areas

*Scotts Oriole
(Icterus parisorum)

C,D,E,F

U-P
summer resident

Unknown

Pinion-juniper wood-
lands of desert mountains
oak slopes and cottonwood
trees in canyons

!Rusty Blackbird
(Euphagus carolinus)

A

O-P
transient

Unknown

Wooded marshes and
riparian woodlands

!Brewer's Blackbird
(Euphagus evanocephalus)

A,B,C,D,E,F

C-P
resident

Unknown

Varied open coun-
lakeshores, etc.

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Subject:

feed lots,
parks and cities

!Common Crackle
(Quiscalus quiscula)

A,B,D

A-P
transient

Unknown

Farms, fields, stream-
sides and wet woodlands

!Brown-headed Cowbird
(Molothrus ater)

A,B,C,D,E,F

C-P
resident

Unknown

Farms, fields, barnyards
wood edges and riparian
woodlands

Family Thraupidae

!Western Tanager
(Piranga ludoviciana)

A,B,C,D,E,F

C-P
summer resident

Unknown

Open coniferous, aspen or
mixed forests; widespread
in migration

Family Embarizidae

Rose-breasted Grosbeak
(Pheucticus ludovicianus)

F

O-P
summer resident

Unknown

Broadleaf riparian areas
and aspens

!Black-headed Grosbeak
(Pheucticus melanocephalus)

A,B,C,D,E,F

C-P
summer resident

Unknown

Edges of second growth
deciduous woods, pinion,
riparian areas, orchards
and parks

!Blue Grosbeak (Guiraca caerulea)

B,C,D,E,F

G-P
summer resident

Unknown

Brushy and weedy places,
willows and river thickets
and other riparian areas

Lapland Longspur
(Calcarius lapponicus)

A,B,C,D,E,F

R-P
winter resident

Unknown

Fields, grasslands,
saline flats, desert
shrub; often seen with
horned larks

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Subject:

!Indigo Bunting (<u>Passerian cyanea</u>)	A,B,D	R-P summer resident	Unknown	Brush, farm lands and streamsides
!Lazuli Bunting (<u>Passerian amoena</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain brush, stream- side shrubs and farmland tree rows
!Green-tailed Towhee (<u>Chlorura chlorura</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Low mountain brush, greasewood and pinion- juniper woodlands
!Fugous-sided Towhee (<u>Pipilo erythrophthalmus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Mountain brush, forest edges and city shrubs
Lark Bunting (<u>Calamospiza melanocorvus</u>)	A,B,C,D,E,F	O-P transient	Unknown	Plains, prairies, desert shrub and sagebrush
Savannah Sparrow (<u>Passercules sandwichensis</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Grasslands, fields, saltgrass meadows and open country
!*Grasshopper Sparrow (<u>Ammodramus savannarum</u>)	A,B,C,D,E,F	K-P transient	Unknown	Dry grasslands
LeConte's Sparrow (<u>Amospiza lecontei</u>)	F	A-P	Unknown	Tall grass, weedy
!Vesper sparrow (<u>Pooecetes gramineus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Alfalfa and grain fields, meadows, sage- brush and desert shrub

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Subject:

!Lark Sparrow (<u>Chondestes grammacus</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country in sagebrush and desert shrub with available perch sites
Sage Sparrow (<u>Amphispiza belli</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs
Dark-eye Junco (<u>Junco hyemalis</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer openings and edges of coniferous and mixed woodlands; in winter greasewood and undergrowth
!Gray-headed Junco (<u>Junco caniceps</u>)	A,B,C,D,E,F,	C-P summer resident	Unknown	Coniferous, mixed forests and mountain brush
!Tree Sparrow (<u>Spizella arborea</u>)	A,B,C,D,E,F	U-P winter resident	Unknown	Willow thickets and brushy areas
!Chipping Sparrow (<u>Spizella passerina</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain coniferous and deciduous woodlands valley woodlands, farms, orchards, parks and brushlands
!Brewer's Sparrow (<u>Spizella breweri</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs or brushy areas
!Harris Sparrow (<u>Zonotrichia querula</u>)	A,B,C,D,E,F	U-P winter resident	Unknown	Brushy edges of open woodlands, Russian olives and willows
!White-crowned Sparrow (<u>Zonotrichia leucophrys</u>)	A,B,C,D,E	C-P resident	Unknown	In summer forest edges and clearings. brush

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Subject:

White-throated Sparrow (<u>Zonotricia albicollis</u>)	E,F	R-P winter resident	Unknown	and mountain thickets; in winter widespread in the valleys, along fence rows willows, brushy areas, corn and greasewood
Golden-crowned Sparrow (<u>Zonotricia atricapilla</u>)	E,F,	R-P winter resident	Unknown	Coniferous and mixed woodlands, woodland undergrowth thickets and brush
Swamp Sparrow (<u>Zonotricia georgiana</u>)	F	U-P winter resident	Unknown	Mountain brush and brushy areas in the lower valley
!Fox Sparrow (<u>Zonotricia iliaca</u>)	A,B,C	K-P summer resident and transient	Unknown	Marshes; in migration weedy fields
!Lincoln's Sparrow (<u>Zonotricia lincolni</u>)	A,B,C	U-P summer resident R-P winter resident	Unknown	Valley and mountain woodlands and brushy areas usually near water
!Song Sparrow (<u>Zonotricia melodia</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer willow thickets, brushy bogs; in winter lowland thickets, tall weeds and bushes
				Woodland edges, grasslands, cattail marshes, thickets and br fence rows

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Subject:

!Black-throated Sparrow (<u>Amphispiza bilineata</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Pinion-juniper, mountain brush and sagebrush
Family Fringillidae Evening Grosbeak (<u>Coccothraustes vespertinus</u>)	A,B,C,D,E,F	C-P winter resident	Unknown	Boxelders, Russian olive trees and fruiting shrubs
!Cassin's Finch (<u>Carpodacus cassinii</u>)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Unknown	In summer, open conifer forests of high mountains in winter valleys
!House Finch (<u>Carpodacus mexicanus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Varied habitats; towns, ranches, open woods, mountain scrub, canyons deserts and riparian area
!Pine Grosbeak (<u>Pinicola enucleator</u>)	A,B,C,E,F	U-P resident	Unknown	In summer coniferous forests; in winter mixed woods and fruiting trees
!Rosy Finch (<u>Leucosticte arctoa</u>)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine tundra, meadows and snowfields; winters in lowlands
!Pine Siskin (<u>Carduelis pinus</u>)	A,B,C,E,F,	C-P resident	Unknown	Coniferous forests, along edges of second growth deciduous forests; in migration seen in large flocks in the lower valley

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Subject:

!American Goldfinch
(Carduelis tristis)

A,B,C,D,E,F

C-P
resident

Unknown

Riparian woodlands,
willows, cottonwoods,
orchards, roadsides
and sunflowers

!Lesser Goldfinch
(Carduelis psaltria)

A,B,C,D,E,F

C-P
resident

Unknown

Open brushy country,
open woods, wooded
streams and gardens

!Red Crossbill
(Loxia curvirostra)

A,B,C,E,F

U-P
summer resident

Unknown

Coniferous forests

Mammals — 103 species in southeastern Utah

Order Insectivora

Family Soricidae

!*Dwarf Shres (Sorex nanus)

B,C,D,E,F

L-H

Unknown

Open grass-covered
areas which may have
scattered brush, marshes,
coniferous forests and
openings in woods

!North Water Shrew
(Sorex palustris)

A,B,C,E,F

C-N

Unknown

Along nearly all
permanent streams in
mountainous areas

!Merriam Shrew (Sorex merriami)

A,B,C,D,E,F

U-N

Unknown

Arid sagebrush or
grassland areas,
mountain mahogany,
coniferous forests, aspen
and cottonwoods

!Vagrant Shrew (Sorex vagrans)

A,B,C,F

C-N

Unknown

Marshes, bogs, wet
meadows and along
streams in for

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Subject:

!Masked Shrew (<u>Sorex cinereus</u>)	A,B,D,E	C-N	Unknown	Moist sites in forests, open country and brushland
!Dusky Shrew (<u>Sorex obscurus</u>)	A,B,C,F	C-N	Unknown	Marshes, coniferous forests and dry hillsides
*Gray (Desert) Shrew (<u>Notiosorex crawfordi</u>)	E,F	L-N	Unknown	Arid alluvial fans, brushy slopes, sagebrush and other low desert shrub communities

Order Chiroptera

Family Vespertilionidae

!Little brown Myotis
(Myotis thyanodes)

A,B,C,D,E,F

C-N

Unknown

Caves, mine tunnels,
hollow trees or buildings
usually near water

!Frigid Myotis (Myotis thysanodes)

A,B,C,D,E,F

U-N

Unknown

Caves, old buildings, rock
crevices, pinion-juniper
and desert shrub

!Long-eared Myotis (Myotis evotis)

A,B,C,D,E,F

C-N

Unknown

Coniferous forests in high
mountains, around
buildings
or trees and occasionally
caves

Long-legged Myotis (Myotis volans)

A,B,C,D,E,F

C-N

Unknown

Buildings, small pockets,
crevices in rock ledges
and trees

!Yuma Myotis (Myotis yumanensis)

A,B,C,D,E,F

U-N

Unknown

Caves, tunnels and
buildings in arid areas

!California Myotis
(Myotis californicus)

A,B,C,D,E

C-N

Unknown

Mine tunnels.

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Subject:

					trees, loose rocks, buildings, bridges; chiefly a crevice dweller (up to 6,000 feet in elevation)
!Small-footed Myotis (<u>Myotis leibii</u>)	A,B,C,D,E,F	U-N	Unknown		Caves, mine tunnels, crevices on rocks and on buildings
!Silver-haired Bat (<u>Lasionycteris noctivagans</u>)	A,B,C,D,E,F	C-N	Unknown		Forest areas, occasionally in caves or buildings
!Western Pipistrelle (<u>Pipistrellus hesperus</u>)	A,B,C,D,E,F	C-N	Unknown		Caves, under loose rocks, crevices, in cliffs, buildings; arid areas near water courses
!Big Brown Bat (<u>Eptesicus fuscus</u>)	A,B,C,D,E,F	C-N	Unknown		Caves, tunnels, crevices, hollow trees, buildings and wooded areas
!*Red Bat (<u>Lasiurus borealis</u>)	A,B,C,D,E,F	L-N	Unknown		Wooded areas; roosts in trees and occasionally enters caves
!Hoary Bat (<u>Lasiurus cinereus</u>)	A,B,C,D,E,F	U-N	Unknown		Wooded areas
!*Western Big-eared Bat (<u>Plecotus townsendii</u>)	A,B,C,D,E,F	C-N	Unknown		Caves, mine tunnels and buildings utilized for roosting; inhabits arid western desert shrub, pinion-juniper and pine forests

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Subject:

Mexican Big-eared Bat (<u>Plectus phyllotis</u>)	F	L-N	Unknown	Caves in pine-oak forests between 5,000 to 8,500 feet elevation
!Spotted Bat (<u>Euderma maculata</u>)	Unknown	L-H	Unknown	Arid country; it occasionally enters buildings and caves
!Pallid Bat (<u>Antrozous pallidus</u>)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, crevices in rocks, buildings and trees are utilized for roosts; inhabits scattered desert shrub and pine-oak forests below 6,500 feet elevation
Family Molossidae				
!Mexican Free-tailed Bat (<u>Tadarida brasiliensis</u>)	A,B,C,D,E,F	C-N	Unknown	Caves and buildings are utilized for roosts; inhabits lower and upper Sonoran Life Zones
Order Lagomorpha				
Family Ochotonidae				
Pika (<u>Ochontona princeps</u>)	A,B,C,E,F	C-N	Unknown	Talus slopes and rock sides above 8,000 feet elevation
Family Leporidae				
!White-tailed Jackrabbit (<u>Lepus townsendii</u>)	A,B,C,D	C-N	Stable	Open, grassy or sage- brush areas at medium elevation

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Subject:

!*Snowshoe Hare (<u>Lepus americanus</u>)	A,B,C,	L-P	Cyclic	Coniferous forests and aspen, riparian and brush types near conifers
!Black-tailed Jackrabbit (<u>Lepus californicus</u>)	A,B,C,D,E,F,	C-N	Stable	Open grassland, sagebrush and desert shrub areas at low to medium elevations
!*Mountain Cottontail (<u>Sylvilagus nuttallii</u>)	A,B,C,E,F	C-P	Stable	Thickets, sagebrush, loose rocks, cliffs and forests
!*Desert Cottontail (<u>Sylvilagus audubonii</u>)	A,B,C,D,E,F	C-P	Stable	Open plains, foothills and low valleys with grass, sagebrush or scattered pinion-juniper
Order Rodentia				
Family Sciuridae				
Zuni Prairie Dog (<u>Cynomys gunnisoni</u>)	F	C-N	Stable	Mountain valleys, 5,000-12,000 feet elevation; open to slightly brushy country with scattered pinion-juniper
White-tailed Prairie Dog (<u>Cynomys leucurus</u>)	A,B,C,D,E,F	C-N	Stable	Valleys and flatlands where vegetation is sparse
*Abert Squirrel (<u>Sciurus aberti</u>)	F	L-P	Stable	Ponderosa pines
!Red Squirrel (<u>Tamiasciurus hudsonicus</u>)	A,B,C,F	C-N	Stable	Coniferous forests in the mountains

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Subject:

*Spotted Ground Squirrel (<u>Spermophilus spilosoma</u>)	F	L-N	Unknown	Open forests, scattered brush and grassy areas with sandy soil is preferred
!Rock Squirrel (<u>Spermophilus variegatus</u>)	A,B,C,D,E,F	C-N	Stable	Rocky canyons with boulder strewn slopes, riparian woodlands, and ditchbanks
!Unintah Ground Squirrel (<u>spermophilus armatus</u>)	A,B	C-N	Stable	Meadows and edges of fields near green vegetation up to 8,000 feet elevation
Golden-mantled Ground Squirrel (<u>Spermophilus lateralis</u>)	A,B,C	C-N	Stable	Mountain brush, open pine and spruce-fir forests to above timberline
Whitetail Antelope Squirrel (<u>Ammospermophilus leucurus</u>)	A,B,C,D,E,F	C-N	Stable	Arid areas of low desert and foothills with sparse vegetation
!Yellow-bellied Marmot (<u>Marmota flaviventris</u>)	A,B,C,E,F	C-N	Stable	Rocky sites or talus slopes along valleys or in foothills 5,000 to 9,000 feet elevation
!*Northern Flying Squirrel bu (<u>Glaucomys sabrinus</u>)	A,B,C,F	K-N	Unknown	Coniferous and deciduous forests in high mountains

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Subject:

!Least Chipmunk (<u>Eutamias minimus</u>)	A,B,C,D,E,F	C-N	Stable	Variety of habitat types including sagebrush, desert shrub, mountain bush, coniferous and mixed forest areas
Colorado Chipmunk (<u>Eutamias quadrivittatus</u>)	C,E,F	C-N	Stable	Coniferous forests, mountain brush areas, rocky slopes and ridges
!Utah Chipmunk (<u>Eutamias umbrinus</u>)	A,B,D,E,F	C-N	Stable	Coniferous forest and mountain brush areas up to timberline with rocky slopes
!Cliff Chipmunk (<u>Eutamias dorsalis</u>)	A,B,C,D,E	U-N	Stable	Pinion-juniper slopes, riparian woodlands with rocky areas
Family Geomyidae				
!Northern Pocket Gopher (<u>Thomomys talpoides</u>)	A,B,C,D,E,F	C-N	Unknown	Grassy prairies, alpine meadows, brush areas, open pine forests; generally restricted to the mountains
!Valley or Botta Pocket Gopher (<u>Thomomys bottae</u>)	A,B,C,D,E,F	C-N	Unknown	Valleys and mountain meadows; prefers loam soil but may be found in sandy or rocky situations
!Ord Kangaroo Rat (<u>Dipodomys ordii</u>)	A,B,C,D,E,F	C-N	Unknown	Desert shrub, pinion-juniper and tamarisk communities; sandy soils

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Subject:

preferred but found on
hard soils

Baird Pocket Mouse
(Perognathus flavus)

F

C-N

Unknown

Prefers short grass
areas with sandy or
rocky soils

!Great Basin Pocket Mouse
(Perognathus parvus)

A,D

C-N

Unknown

Sagebrush or greasewood
and other desert shrub
communities and pinion-
juniper

Apache Pocket mouse
(Perognathus apache)

C,D,F

C-N

Unknown

Sparse brushlands and
scattered pinion-juniper,
usually 5,000-7,200
feet elevation

Family Castoridae

!* Beaver (Castor canadensis)

A,B,C,D,E,F

C-P

Increasing

Streams, lakes
and irrigation
systems with poplars,
birch or willows
on the bank

Family Cricetidae

!Western Harvest Mouse
(Reithrodontomys megalotis)

A,B,C,D,E,F

C-N

Unknown

Grasslands, open desert,
wetlands, irrigated farm-
land of dense vegetation
near water

!Canyon Mouse (Peromyscus crinitus)

A,B,C,D,E,F

C-N

Unknown

Rocky canyons and slopes
with mountain brush

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Subject:

!Deer Mouse (<u>Peromyscus maniculatus</u>)	A,B,C,D,E	C-N	Unknown	All dry-land habitat and irrigated farmland within its range
!Brush Mouse (<u>Peromyscus boyleyi</u>)	A,B,C,D,E,F	C-N	Unknown	Brushy areas of arid and semi-arid regions; prefers rocky sites
!Pinion Mouse (<u>Peromyscus truei</u>)	A,B,C,D,E,F	C-N	Unknown	Rocky terrain in pinion-juniper areas
Northern Grasshopper Mouse (<u>Onychomys leucogaster</u>)	C,F	U-N	Unknown	Open country of grass, sagebrush or greasewood and sandy or gravelly soil
*White-throated Wood Rat (<u>Neotoma albigula</u>)	F	K-N	Unknown	Brushland with rocky cliffs and shallow caves
!Desert Wood Rat (<u>Neotoma lepida</u>)	A,B,C,D,E	C-N	Unknown	Desert floors and rocky slopes with low desert vegetation or arid mountain brush
*Mexican Wood Rat (<u>Neotoma mexicana</u>)	F	K-N	Unknown	rocks, cliffs and mountains
!Bush-tailed Wood Rat (<u>Neotoma cinerea</u>)	A,B,C,D,E,F	C-N	Unknown	High mountains with rimrock, rock slides and pines
!Muskrat (<u>Ondatra zibethicus</u>)	A,B,C,D,E,F	C-N	Stable	Marshes, edge of ponds, lakes, streams and irrigation channels

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Subject:

!Meadow Vole (<u>Microtus pennsylvanicus</u>)	A,D	C-N	Unknown	Moist areas a with dense growth of grasses
!Mountain Vole (<u>Microtus montanus</u>)	A,B,D,E	C-N	Unknown	Dense vegetation in sagebrush-grass communities
!Richardson's Vole (<u>Microtus richardsoni</u>)	A	C-N	Unknown	Creekbanks and marshes
!Longtail Vole (<u>Microtus longicaudus</u>)	A,B,C,D,E,F	C-N	Unknown	In summer streambanks, mountain meadows with dry sites; in winter brushy areas
Sagebrush Vole (<u>Lagurus curtatus</u>)	C,F	C-N	Unknown	Scattered sagebrush with loose soil and arid conditions
Family Muridae				
!Black Rat (<u>Rattus rattus</u>)	A,B,C,D,E,F	C-N	Unknown	Buildings and dumps
!Norway Rat (<u>Rattus norvegicus</u>)	A,B,C,D,E,F	C-N	Unknown	Burrows along building foundations and beneath rubbish piles
!House Mouse (<u>Mus musculus</u>)	A,B,C,D,E,F	C-N	Unknown	Buildings and occasionally in fields
Family Zapodidae				
!Western Jumping Mouse (<u>Zapus princeps</u>)	A	C-N	Unknown	Low meadows near streams with lush growth of grasses and forbs and in various land

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Subject:

Family Erethizontidae				
!Porcupine (<u>Erethizon dorsatum</u>)	A,B,C,D,E,F	C-N	Stable	Forested areas, occasionally away from trees if brush is available
Order Carnivora				
Family Canidae				
!Coyote (<u>Canis latrans</u>)	A,B,C,D,E,F	C-N	Stable	Ubiquitous
!*Red Fox (<u>Vulpes fulva</u>)	A,B,C,D,E,F	K-N	Unknown	Forest and open country preferred
*Kit Fox (<u>Vulpes macrotis</u>)	A,B,C,D,E,F	K-N	Unknown	Open level, sandy ground preferred with low desert vegetation
!Gray Fox (<u>Urocyon cinereoargenteus</u>)	A,B,C,D,E,F	C-N	Stable	Brush and open forests
!*Gray Wolf (<u>Canis lupus</u>)	A,B,C,D,E,F	E-P	Decreasing	Wilderness forests
Family Ursidae				
!*Black Bear (<u>Ursus americanus</u>)	A,B,C,E,F	C-P	Increasing	Mountainous areas
!*Grizzly Bear (<u>Ursus horribilis</u>)	A,B,C,E,F	X-P	Extirpated	Remote mountainous regions
Family Procyonidae				
!Ring-tailed Cat (<u>Bassariscus astutus</u>)	A,B,C,D,E,F	C-N	Stable	Near water on slopes with mountain brush, rocky ridges and cliffs
!*Raccoon (<u>Procyon lotor</u>)	A,B,C,D,E,F	K-N	Unknown	Along streams, lake borders and near wooded areas or rock cli

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Subject:

Family mustelidae

!*Short-tailed Weasel
(Mustela erminea)

A,B,C,F

K-P

Unknown

Brushy or wooded areas
not far from water

!*Long-tailed Weasel
(Mustela frenata)

A,B,C,D,E,F

C-P

Stable

All land habitat types
near water

!*Mink (Mustela vison)

A,B,C,F

L-P

Unknown

Along streams and lakes

!*Wolverine (Gulo luscus)

A,B

L-P

Unknown

Remote mountain regions

Black-footed Ferret
(Mustela nigripes)

A,B,C,D,G

E-P

Unknown

Prairie dog towns

*Marten (Martes caurina)

A,B,C,F

R-P

Unknown

Coniferous forests at
high elevations

!*Badger (Taxidea taxus)

A,B,C,D,E,F

C-P

Stable

Open grasslands, deserts
and high mountain forests
where prey is available

!*Striped Skunk
(Mephitis mephitis)

A,B,C,D,E,F

C-P

Increasing

Semi-open country of
prairie, brushlands or
mixed woodlands within
two miles of water

!*Spotted Skunk
(Spilogale gracilis)

A,B,C,D,E,F

C-P

Stable

Prairies or grasslands
with brushy or sparsely
wooded areas along streams
with boulders

*River Otter
(Lutra canadensis)

A,B,C,D,E,F

L-P

Unknown

Along streams and
lake borders

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Subject:

Family Felidae					
! *Bobcat (<u>Lynx fefus</u>)	A,B,C,D,E,F	L-P	Unknown	Rimrock and mountain brush areas	
! *Canada Lynx (<u>Lynx canadensis</u>)	A,B,C,E,F	L-P	Unknown	Forested areas in the mountains	
! *Cougar (<u>Felis concolor</u>)	A,B,C,D,E,F	C-P	Stable	Rugged mountains with forests, cliffs and ledges	
Order Artiodactyla					
Family Cervidae					
! *Mule Deer (<u>Odocoileu hemionus</u>)	A,B,C,D,E,F	C-P	Increasing	Coniferous forests, desert shrub, mountain brush, grassland with shrubs and other habitats where browse species are present	
! *Moose (<u>Alces alces</u>)	A	L-P	Increasing	Mountainous areas, forests, mountain brush and willow bottoms	
! *Rocky Mountain Elk (<u>Cervus canadensis</u>)	A,B,C,E,F	C-P	Increasing	Semi-open forests, mountain meadows (in summer), foothills, plains and valleys	
Family Antilocapridae					
*Pronghorn Antelope (<u>Antilocapra americana</u>)	B,C,D,E,F	L-P	Stable	Open prairies and sagebrush or desert shrub plains	
Family Bovidae					
*Desert Bighorn Sheep (<u>Ovis canadensis nelsoni</u>)	D,E,F	L-P	Increasing	Precipitous terrain	

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Subject:

				mountain and canyon slopes and rims with sparse growth of trees
*Rocky Mountain Bighorn Shi Sheep (<u>Ovis canadensis canadensis</u>)	B,C	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
*Bison (<u>Bison bison</u>)	E	L-P	Stable	Desert shrub plains of the Burr Desert and mountain brush forest habitats associated with steep mountain slopes of the Henry Mountains

Table 1 - List of Game Species and Region of Inhabitation Within Utah

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
10 BIG GAME SPECIES					
Bison	X	X			
Black Bear	X	X	X	X	X
Cougar	X	X	X	X	X
Desert Bighorn Sheep	X	X			
Elk	X	X	X	X	X
Moose	X		X	X	X
Mountain Bighorn Sheep	X		X	X	X
Mountain Goat			X		
Mule Deer	X	X	X	X	X
Pronghorn Antelope	X	X	X	X	X
Subtotal	9	7	8	7	7
20 GAME FISH SPECIES					
Arctic Grayling		X		X	X
Black Bullhead	X	X	X	X	X
Black Crappie	X	X	X	X	X
Bluegill	X	X	X	X	X
Bonneville Cisco					X
Brook Trout	X	X	X	X	X
Brown Trout	X	X	X	X	X
Channel Catfish	X	X	X	X	X
Outthroat Trout	X	X	X	X	X
Golden Trout			X	X	
Kokanee Salmon				X	X

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
Lake Trout		X	X	X	X
Largemouth Bass	X	X	X	X	X
Mountain Whitefish			X	X	X
Northern Pike	X	X			
Perch	X	X	X	X	X
Rainbow and Albino Trout	X	X	X	X	X
Smallmouth Bass			X	X	X
Striped Bass	X	X			
Walleye	X	X	X	X	X
White Bass		X	X		
Subtotal	<u>13</u>	<u>16</u>	<u>16</u>	<u>17</u>	<u>17</u>
9 FURBEARER SPECIES					
Badger	X	X	X	X	X
Beaver	X	X	X	X	X
Long-tailed Weasel	X	X	X	X	X
Marten	X	X	X	X	X
Mink	X	X	X	X	X
River Otter	X			X	X
Short-tailed Weasel	X	X	X	X	X
Spotted Skunk	X	X	X	X	X
Striped Skunk	X	X	X	X	X
Subtotal	<u>9</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>9</u>
43 MIGRATORY GAME BIRD SPECIES					
American Widgeon	X	X	X	X	X
Band-Tail Pigeon	X	X	X		
Barrows Goldeneye	X	X	X	X	X
Black Brant		X			X
Black Duck		X	X		X
Blue-winged Teal	X	X	X	X	X

Game Species of Utah	REGION					
	Southeastern	Southern	Central	Northeastern	Northern	
Bufflehead	X	X	X	X	X	X
Canada Goose	X	X	X	X	X	X
Canvasback	X	X	X	X	X	X
Cinnamon Teal	X	X	X	X	X	X
American Coot	X	X	X	X	X	X
Common Gallinule	X	X	X	X	X	X
Common Goldeneye	X	X	X	X	X	X
Common Merganser	X	X	X	X	X	X
Common Snipe	X	X	X	X	X	X
European Widgeon			X			X
Fulvous Tree Duck		X				X
Gadwall	X	X	X	X	X	X
Greater Scaup	X	X	X	X	X	X
Green-winged Teal	X	X	X	X	X	X
Harlequin Duck						X
Hooded Merganser	X	X	X	X	X	X
Lesser Scaup	X	X	X	X	X	X
Mallard	X	X	X	X	X	X
Mourning Dove	X	X	X	X	X	X
Old Squaw		X	X			X
Pintail	X	X	X	X	X	X
Red-breasted merganser	X	X	X	X	X	X
Red head	X	X	X	X	X	X
Ring-necked Duck	X	X	X	X	X	X
Ross Goose	X	X				X
Ruddy Duck	X	X	X	X	X	X
Sandhill Crane	X	X	X	X	X	X
Shoveler	X	X	X	X	X	X
Snow Goose	X	X	X	X	X	X
Sora Rail	X	X	X	X	X	X
Surf Scoter			X			X
Trumpeter Swan		X	X			X
Virginia Rail	X	X	X	X	X	X

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
Whistling Swan	X	X	X	X	X
White-fronted Goose	X	X	X	X	X
White-winged Scooter	X	X	X		X
Wood Duck	X	X	X	X	X
Subtotal	<u>35</u>	<u>40</u>	<u>39</u>	<u>31</u>	<u>42</u>
5 SMALL GAME-MAMMAL SPECIES					
Abert Squirrel X					
Desert Cottontail					
	X	X	X	X	
Mountain Cottontail	X	X	X	X	X
Pigmy Cottontail		X	X		X
Snowshoe Hare	X	X	X	X	X
Subtotal	<u>4</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>3</u>
12 SMALL GAME-UPLAND BIRD SPECIES					
Blue Grouse	X	X	X	X	X
California Quail	X	X	X	X	X
Chukar	X	X	X	X	X
Gambels Quail	X	X			
Hungarian Partridge			X		X
Merriam's Turkey	X	X			
Ring-necked Pheasant	X	X	X	X	X
Ruffed Grouse	X	X	X	X	X
Sage Grouse	X	X	X	X	X
Sharp-tailed Grouse					X
White-tailed Ptarmigan				X	X
White-winged Pheasant	X	X			
Subtotal	<u>9</u>	<u>9</u>	<u>7</u>	<u>7</u>	<u>9</u>

Game Species of Utah	Southeastern	Southern	REGION			
			Central	Northeastern	Northern	
100 Total Game Species in Utah	78	83	81	73	86	

Table 2. Classification of the 466 species of vertebrate wildlife that inhabit six biogeographic areas within Southeastern Utah.

	Biogeographic Areas ¹ *					
	A	B	C	D	E	F
FISH	14	20	15	15	24	31
Protected-Threatened	(0)	(1)	(1)	(1)	(1)	(1)
Protected-Endangered	(1)	(3)	(2)	(1)	(1)	(2)
Protected-Nongame	(10)	(11)	(9)	(10)	(12)	(16)
Protected-Game	(4)	(5)	(3)	(3)	(10)	(12)
AMPHIBIANS	6	5	6	7	7	10
Protected-Nongame	(1)	(1)	(1)	(1)	(1)	(2)
Unprotected-Nongame	(5)	(4)	(5)	(6)	(6)	(8)
REPTILES	18	14	15	14	21	28
Unprotected-Nongame	(18)	(14)	(15)	(14)	(21)	(28)
BIRDS	242	244	242	235	251	262
Protected-Extirpated	(1)	(1)	(1)	(1)	(1)	(1)
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(2)	(2)	(2)	(2)	(2)	(2)
Protected-Nongame	(199)	(202)	(202)	(193)	(208)	(217)
Protected-Game	(39)	(38)	(36)	(38)	(39)	(41)
Unprotected-Nongame	(1)	(1)	(1)	(1)	(1)	(1)
MAMMALS	84	80	80	65	66	90
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(1)	(1)	(1)	(1)	(0)	(1)
Protected-Extirpated	(2)	(2)	(2)	(0)	(2)	(2)

¹ Biogeographic areas of southeastern Utah
A - Wasatch Plateau east of Skyline Drive
B - West Tavaputs Plateau
C - East Tavaputs Plateau
D - San Rafael Swell and Desert
E - Henry Mountains and Burr Desert
F - Mountains and Deserts south of I-70 in Grand and San Juan counties

	A	B	C	D	E	F
Protected-Game	(18)	(19)	(19)	(21)	(16)	(19)
Unprotected-Extirpated	(0)	(0)	(0)	(0)	(0)	(0)
Unprotected-Nongame	(63)	(58)	(58)	(52)	(53)	(62)
<hr/>						
Total Protected Species	277	286	279	263	293	317
<hr/>						
TOTAL:	364	363	358	336	369	421

VERTEBRATE SPECIES OF WILDLIFE HAVING HIGH INTEREST TO THE
STATE OF UTAH

Class of Animal	Statewide ¹ *	SER ² **	Number of Species
			Price River Coal Company Braztah Complex
Fish	33	20	4
Amphibians	3	2	1
Reptiles	10	4	2
Birds	104	95	31
Mammals	61	40	27
TOTAL	211	161	71

*1. Utah Division of Wildlife Resources as the state of Utah's Wildlife authority recognizes 211 species of vertebrate wildlife that inhabit the state as being of high interest. High interest wildlife represent all game species and all species having significant economic importance from either a consumptive or nonconsumptive perspective or special aesthetic, scientific or educational values. This list includes all federally listed threatened or endangered species of wildlife.

**2. Evaluation of data presented in Utah Division of Wildlife Resources publication No. 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" shows that 161 of the 211 species of the states high interest wildlife inhabit the Southeastern Region (SER) of the state on occasion of during different seasons of the year.

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APPENDIX 10-B

FISH AND WILDLIFE RESOURCES INFORMATION

AND

PROTECTION PLANS

RECOMMENDED PLANT MATERIALS FOR RESOTRATION
OR ENHANCEMENT OF WILDLIFE HABITATS

Recommended Plant Materials and Rates of Application
for Restoration or Enhancement of
Wildlife Habitats

COMMON AND BOTANICAL NAMES FOR VEGETATION SPECIES IN THE ATTACHED TABLES THAT HAVE BEEN SUGGESTED FOR USE WITH ENHANCEMENT OR RECLAMATION PROJECTS THAT WOULD BENEFIT WILDLIFE

Common Name	Botanical Name	Common Name	Botanical Name
Alfalfa, (Ladak, Nomand, Rambler, Teton, Travois)	Medicago sativa	Bluegrass, Canada	P. compressa
Alfalfa, sickle	M. falcatus	Bluegrass, Kentucky	P. pratensis
Alfileria	Erodium cicutarium	Bluegrass, Nevada	P. nevadensis
Alkaligrass, nuttal	Puccinellia airoides	Bluegrass, Sandbert	P. secunda
Angelica, small-leaf	Angelica pinnata	Bouncing-bet	Saponaria officianlis
Apache-plume	Fallugia paradoxa	Boxelder	Acer negundo negundo
Ash, singleleaf	Fraxinus anomala	Brome, cheatgrass	Bromus tectorum tecotrum
Aspen, quaking	Populus tremuloides	Brome, meadow	B. erectus
Aster, alpine leafybract	Aster foliaceus	Brome, mountain	B. carinatus
Aster, Engelmann	A. engelmannii	Brome, nodding	B. anomalus
Aster, Pacific	A. chilensis adscendens	Brome, red (foxtail)	B. rubens
Aster, smooth (or blue)	A. Glaucodes	Brome, smooth (noterhn)	B. inermis
Balsamroot, arrowleaf	Balsamorhiza sagittata	Brome, smooth (southern)	B. inermis
Balsamroot, cutleaf	B. macrophylla	Brome, subalpine	B. tomentellus
Barberry, creeping	Berberis repens	Buffaloberry, roundleaf	Shepherdia rotundifolia
Barberry, Fremont	B. fremontii	Buffaloberry, russet	S. canadensis
Barley, bulbous	Hordeum bulbosum	Buffaloberry, silver	S. argentea
Barley, meadow	H. brachyantherum	Burnet, small	Sanguisorba minor
Bassia, fivehook (alkaliweed, ragweed, smotherweed)	Basia hyssopifolia	Buttercup, bur	Ranunculus testiculatus
Bitterbush, antelope	Purshia tridentata	Cacti	Cactaceae
Bitterbrush, desert	P. glandulosa	Canarygrass, reed	Phalaris arundinacea
Blackbrush	Coleogyne ramosissima	Ceanothus, Martin	Ceanothus martinii
Bladdersenna, common	Colutea arborescens	Ceanothus, redstem	C. sanguineus
Bluegrass, big	Poa ampla	Ceanothus, snowbrush	C. velutinus
Bluegrass, gulbous	P. pulbosa	Checkermallow, Oregon	Sidalcea oregana
Cinquefoil, bush	Potentilla fruticosa	Cherry, Bessey (sand)	Prunus besseyi
		Chokecherry, blacke (common)	P. virginiana melanocarpa
		Fescue, hard sheep	Festuca ovina duriscula

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Subject:

Cliffrose, Stansbury
Clover, alsike
Clover, strawberry
Collomia, slenderleaf
Columbine, Colorado
Cotoneaster, Peking
Cowparsnip, common
Creostebush, spreading
Crownvetch, coronilla
Currant, golden
Currant, gooseberry
Currant, squaw
Curran, sticky
Cypress, Arizona
Cypress, Belvedere summer
Daisy, common oxeye
Dandelion, common
Deathcamas
Dogwood, redosier
Douglas-fir

Dropseed, sand
Dropseed, spike

Elder, blueberry
Elder, redberry
Ephedra, green
Ephedra, Nevada
Eriogonum, chushion
Eriogonum, Wyeth

Groundsel, butterwood
Hair-grass, tufted
Halogeton
Hawthorn, river
Helianthella, oneflower
Honeylocust, common

Cowania mexicana stansuriana
Trifolium hybridum
T. fragiferum
Collomia linearis
Aquilegia coerulea
Cotoneaster acutifolia
Heracleum lanatum
Larrea divaricata
Coronilla varia
Ribes aureum
R. montigenum
R. cereum inebrians
R. viscosissimum viscosissimum
Cupressus arizonica
Kochia scoparia
Chrysanthemum leucanthemum
Taraxacum officinale
Zigadenus spp.
Cornus stolonifera stolonifera
Pseudotsuga menziesii menziesii

Sporobolus cryptandrus
S. contractus

Sambucus cerulea
S. racemosa pubens microbotrys
Ephedra viridis
E. nevadensis
Eriogonum ovalifolium
E. heraclaoides

Senecio serra
Deschampsia caespitosa
Halogeton glomeratus
Caragus douglasii rivularis
Helianthella uniflora
Gleditsia triacanthos

Fescue, reed (alta or tall)
Fescue, sulcata sheep
Fescue, Thurber
Fir, subalpine
Fir, white
Flax, Lewis (or blue)
Fleabane, Oregon

Forestiera, New Mexican
Forestiera, New Mexican
olive
Foxtail, barley

Foxtail, meadow
Foxtail, reed
Galleta
Geranium, sticky
Gianthyssop, nettleleaf

Globemallow,
gooseberryleaf
Globemallow, stream
Goldeneye, Nevada showy

Goldeneye, Canada
Goldenrod, low
Goldenrod, Parry
Goosefoot
Greasewood, black

goldeneye, showy
Lupine, silky
Lupine, silverty
Maple, bigtooth
Maple, Manchurian
Maple, Rocky Mountain
Mimosa-vine

F. arundinacea
F. sulcata
F. thurberi
Abies lasiocarpa
A. concolor
Linum lewissii
Erigeron speciosus
macranthus
Forestiera neomexicana
F. phillyneoides

Hordeum jubatum
jubatum
Alopecurus pratensis
A. arundinaceus
Hilaria jamesii
Geranium viscosissimum
Agastache urticifolia
glaucifolia

Sphaeralcea
Grossulariaefolia
S. rivularis
Viguiera multiflora
nevadensis
Solidago canadensis
S. multiradiata
@. parryi
Chenopodium spp.
Sarcobatus vermiculatus
vermiculatus
Vigulera multiflora
L. sericeus
L. argenteus
Acer grandidentatum
A. mandshuricum
A. glabrum
Lycium halimifolium

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Subject:

Honeysuckle, bearberry
Honeysuckle, Tatarian
Hopsage, spinless
Hopsage, spiny

Iodine bush
Iris, German (common iris)
Ivesia, Gordon

Juniper, Rocky Mountain
Juniper, Utah

Knotweed, Douglas

Lakespur
Leptotaenia, carrotleaf
Lettuce, prickly
Ligusticum, Portal
Lilac, common
Lilac, late
Locust, black
Lomatium, ninelaf
Lomatium, Nattal
Lupine, mountain
Lupine, Nevada
Painted-cup, Northwestern
Peachbrush, desert
Peashrub, Siberian
Peavine, flat
Peavine perennial
Peavine, thickleaf
Juncus balticus Peavine, Utah

Penstemon, Eaton
Penstemon, littlecup
Penstemon, low
Penstemon, Palmer
Penstemon, Rydberg

Lonicera involucrata
L. tatarica
Grayia bradegei
G. spinosa

Allenrolfea occidentalis
Iris germanica
Ivesia gordonii

Juniperus scopulorum
J. oeseosperma

Polygonum douglasii douglasii

Delphinium spp.
Lomatium dissectum
Lactuca serriola
Ligusticum porteri
Syringa vulgaris
S. villosa
Robinia pseudoacacia
Lomatium triternatum
L. nuttallii
Lupinus alpestris
L. nevadensis
Castilleja hispida
Prunus fasciculata
Caragana arborescens
Lathyrus sylvestris
L. latifolius
L. lanszwertii

L. utahensis
Penstemon eatonii
P. sepalulus
P. humilis
P. palmeri
P. rydbergii

Medick black
Mesquite
Milkvetch, chickpea
Milkvetch, sicklepod
Milkvetch, Snakeriver
plains
Milkvetch, tall
Mountain-mahogany,
curleaf
Mountain-mahogany,
littleleaf
Mountain-mahogany,
true or birchleaf
Muhly, mat

Mustard, African

Neddegrass, green
Neddegrass, Letterman

Oak, Gambel (shrubby)
Oatgrass, tall

Ochardgrass

Rhubarb, garden
Ricegrass, Indian

Rose, woods

Rush

Russian-olive
Russianthistle
Rye, mountain
Rye, winter

Sagebrush, alkali

Medicago lupulina
Prosopis spp.
Astragalus cicer
A. falcatus
A. filipes

A. galegiformis
Cercocarpus
ledifolius ledifolius
C. ledifolius intricatus

C. montanus montanus

Muhlenbergia
richardsonii
Malcolmia africana

Stipa viricula
S. lettermani

Quercus gambelii
Arrhenatherum
elatus
Dactylis glomerata

Rheum rhapenticum
Oryzopsis hymenoides
hymenoides
Rosa woodsii
ultramontana
Baltic

Elaeagnus angustifolia
Salsola kali tenuifolia
Secale montanum
S. cereale

Sporobolus airoides

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Subject:

Penstemon, sidehill
Penstemon, thickleaf
Penstemon, toadflax
Penstemon, Wasatch
Pine, pinyon
Pine, ponderosa
Pine, singleleaf pinyon
Plum, American

Quackgrass

Rabbitbrush, Douglas

Rabbitbrush, dwarf
Rabbitbrush, Parry
Rabbitbrush, rubber
Rabbitbrush, small
Raspberry, American red
Redtop
Reedgrass, chee

Serviceberry, Utah
Snowberry, longflower
Snowberry, mountain
Solomon-plume, fat

Sophora, Arizona
Spruce, Colorado blue
Spruce, Engelmann
Squirreltail, bottlebrush
Squaw-apple
Starwort, tuber
Sumac, Rocky Mountain
Smooth
Sumac, skunk bush
Sweetanise
Sweetclover, white
Sweetclover, yellow

P. platyphyllus
P. pachyphyllus
P. linarioides
P. cyananthus
Pinus edulis
P. ponderosa
P. monophylla
Prunus americana

Agrophyron repens

Chrysothamnus viscidiflorus
viscidiflorus
C. depressus
C. parryi parryi
C. nauseosus nauseosus
C. stenophyllus
RubusIdaeus sachalinensis
Agrostis alba
Calamagrostis epigelos

A. utahensis utahensis
Symphoricarpos longiflorus
S. oreophilus
Smilacina racemosa
amplexicaulis
Sophora arizonica
Picea pungens
P. engelmannii
Sitanion hystrix
Peraphyllum ramosissimum
Stellaria jamesiana
Rhus glabra cismontana

R. trilobata trilobata
Osmorhiza occidentalis
Melilotus alba
M. officinalis

Sagebrush, Louisiana

Sagebrush, tarragon
Sagebrush, big
Sagebrush, black
Sagebrush, bud
Sagebrush, fringed
Sagebrush, silver
Salsify, vegetable-
oyster
Saltbush, fourwing
Saltbush, Gardner
Saltbush, shadscale
Saltgrass, inland

Salt-tree, Siberian

Sedge, ovalhead
Seepweed (pickleweed)
Serviceberry, Saskatoon
Violet, goosefoot
Virginsbower, western

Wheatgrass, bearded
Wheatgrass, bearded
bluebunch
Wheatgrass, beardless
Wheatgrass, bluestem
Wheatgrass, bluestem
Wheatgrass, crested
(Fairway)
Wheatgrass, crested
Standard
Wheatgrass, intermediate
Wheatgrass, pubescent
or stiff hair
Wheatgrass, Scribner

airoides
Artemisia ludoviciana
ludoviciana
A. dracunculus
A. tridentata tridentata
A. arbuscula nova
A. spinescens
A. frigida
A. cana cana
Tragopogon porrifolius

Atriplex canescens
A. gardneri
A. confertifolia
Distichlis spicata
stricta
Hallmodendron
halodendron
Carex festivella
Suaeda spp.
Amelanchier alnifolia
Viola purpurea
Clematis ligusticifolia

Agrophyron subsecundum
A. spicatum

A. spicatum inerme
A. smithii
A. smithii
A. cristatum

A. desertorum

A. intermedium
A. trichophorum

A. scribneri

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Subject:

Sweetroot, spreading

Sweetvetch, Utah

Tansymustard, flixweed

Tansymustard, pinnate

Tarweed, cluster

Tenella weed

Timothy

Tumblemustard

Valerian, edible

Vetch, American

Vetch, bramble

Willow, Scouler

Winterfat, common

Woad, Dyers

Wormwood, oldman

Wyethia, mulesears

Yarrow, western

Yellowbrush

Yucca

Yucca, Joshua-tree

Osmorhiza chilensis
(*divaricata*)

Hedysarum boreale
utahensis

Descurainia sophia

D. pinnata

Madia glomerata

Chorispora tenella

Phleum pratense

Sisymbrium altissimum

Valeriana edulis

Vicia americana minor

V. tenuifolia

S. Scouleriana

Eurotia lanata lanata

Isatis tinctoria

Artemisia abrotanum

Wyethia amplexicaulis

Achillea millefolium lanulosa

Chrysothamnus viscidiflorus
lanceolatus

Yucca spp.

Yucca brevifolia brevifolia

Wheatgrass, Siberian

Wheatgrass, slender

Wheatgrass, tall

Wildrye, blue

Wildrye, Colorado

Wildrye, creeping

Wildrye, Great Basin

Wildrye, mammoth

Wildrye, Russian

Wildrye, sabulosa

Wildrye, Salina

Wildrye, yellow

Willow, Gyer

Willow, purpleosier

A. sibiricum

A. trachycaulum

A. elongatum

Elymus glaucus

E. ambiguus ambiguus

E. triticoides

E. cinereus

E. giganteus

E. junceus

E. sabulosus

E. salina

E. flavescens

Salix exigua

stenophylla

S. purpurea purpurea

Table 1. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed shrublands habitats of the montane ecological association. Also included are acceptable alternatives if seed for a plant species is not available. Alternatives marked with an asterisk (*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	North exposures and shady areas		Sunny exposures (south, west, east)		Mixture for tall mountain brush type, shaded sites.	
	Broadcast	Drilled	Broadcast	Drilled	Species	Seeding per acre
	-Pounds per acre -					Pounds
Grasses:					Grasses:	
Fairway crested wheatgrass	2	1	2	1	Smooth brome (southern strain)	5
Smooth brome (southern strains)	4	2	2	1	Fairway crested wheatgrass	1
Intermediate wheatgrass	4	2	2	1	Intermediate wheatgrass	3
Pubescent wheatgrass	0	0	2	1	Orchardgrass (Utah grown)	2
Bluestem wheatgrass	0	0	1	1/2	Tall oatgrass	1
Orchardgrass	1	1/2	1	1/2	Mountain brome	1
Russian wildrye	0	0	1	1/2		
Tall oatgrass	1	1/2	0	0		
Forbs:					Forbs:	
Alfalfa (Nomad, Rambler, Travols, Ladak-equal parts)	2	1	2	1	Alfalfa (creeping strains or Ladak)	1
Chickpea milkvetch	0	0	1	1/2	Pacific aster	1/4
Utah sweetvetch	0	0	1	1/2	Oneflower helianthella	1/2
Yellow sweetclove	0	0	1	1/2	Showy goldeneye	1/4
Arrowleaf balsamroot	1	1/2	1	1/2		
Pacific aster	1	1/2	1	1/2	Totals	15

Table J. Continued

Species	North exposures and shady areas		Sunny exposures (south, west, east)	
	Broadcast	Drilled	Broadcast	Drilled
-Pounds per acre-				
Shrubs:				
Rubber rabbitbrush	1/2	1/4	1/2	1/4
Douglas rabbitbrush	1/2	1/4	1/2	1/4
Big sagebrush	0	0	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Totals	17	8 1/2	20 1/2	10 1/4
Shrubs for pits, major disturbance areas, cleat marks, and drilled areas:				
Antelope bitterbrush	1	1/2	2	1
Golden currant	1/2	1/4	1/2	1/4
Birchleaf mountain mahogany	1	1/2	1/2	1/4
Curleaf mountain mahogany	0	0	1/2	1/4
Cliffrose	0	0	1/2	1/4
Green ephedra	1/2	1/4	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Woods rose	1	1/2	1/2	1/4
Saskatoon serviceberry	0	0	1	1/2
Totals	4	2	7	3 1/2

Alternate Species for Mountain Brush Associations

Grasses:

Bearded bluebunch wheatgrass
 Beardless bluebunch wheatgrass
 Big bluegrass*
 Bluestem wheatgrass
 Bottlebrush squirreltail*
 Bulbous barley*
 Bulbous bluegrass*

Great Basin wildrye
 Green needlegrass*
 Hard sheep fescue
 Indian ricegrass*
 Kentucky bluegrass*
 Meadow brome*
 Mountain rye*

Sand dropseed*
 Siberian wheatgrass
 Slender wheatgrass
 Standard crested wheatgrass
 Sulcata sheep fescue
 Tall wheatgrass*
 Winter rye*

Forbs:

American vetch*
 Bouncing-bet
 Bramble vetch*
 Common cowparsnip*
 Cutleaf balsamroot
 Eaton penstemon*
 German iris*
 Gooseberryleaf globemallow*
 Lewis (or blue) flax

Louisiana sagebrush*
 Low penstemon*
 Nevada showy goldeneye
 Nuttall lomatium
 Palmer penstemon*
 Parry goldenrod*
 Sicklepod milkvetch
 Sidehill penstemon*
 Silky lupine*

Small burnet
 Stream globemallow*
 Sweetanise*
 Tall milkvetch*
 Tarragon sagebrush*
 Thicketleaf penstemon*
 Toadflax penstemon*
 Wasatch penstemon*
 Cushion eriogonum*

Shrubs:

Apache-plume*
 Arizona cypress*
 Black common chokecherry*
 Black sagebrush
 Blueberry elder*
 Boxelder*
 Common bladdersenna*
 Common lilac*
 Creeping barberry*

Desert bitterbrush*
 Desert peachbrush*
 Dwarf rabbitbrush*
 Fringed sagebrush*
 Gambel oak*
 Gardner saltbush*
 Longflower snowberry*
 Martin ceanothus*
 Mountain snowberry*

Nevada ephedra*
 New Mexican forestiera*
 Oldman wormwood (stem cuttings)*
 Parry rabbitbrush*
 Peking cotoneaster*
 Purpleosier willow*
 Redberry elder*
 Rocky Mountain sumac*

Alternate Species for Mountain Brush Associations

Shrubs: (continued)

Rocky Mountain juniper*

Roundleaf buffaloberry*

Russian-olive*

Siberian peashrub*

Silver buffaloberry*

Skunk bush sumac*

Squaw apple*

Tatarian honeysuckle*

Utah serviceberry

Western virginianbower*

Winterfat*

Wyeth erlogonum

Yellowbrush

Table 2. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed aspen and spruce-fir habitats in the montane ecological association. Restoration of tree species should be accomplished with seedling transplants at a rate of about 500 plants per acre. This figure can be greatly influenced by the site index which must be determined by a silviculturist. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times and contact appropriate expertism for input relative to tree replacement. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Shade Openings		Alternate Species	
	-Pounds per acre-			
Grasses:			Grasses:	
Smooth brome (equal portions of northern and southern strains)	4	4	Bearded wheatgrass	Nodding brome
Orchardgrass (Intermountain area)	2	1	Blue wildrye	Slender wheatgrass
Tall oatgrass	2	1	Fairway crested wheatgrass	Subalpine brome
Intermediate wheatgrass	0	2	Meadow brome	Thurber fescue
Mountain brome	1	1		
Meadow foxtail	1	1		
Kentucky bluegrass	1/2	1/2		
Forbs:			Forbs:	
Alfalfa	0	1	Alpine leafybract aster	Pacific aster
Chickpea milkvetch	0	1	American vetch	Porter ligusticum
Mountain lupine	2	1	Bramble vetch	Small-leaf angelica
Silky lupine	1	1	Butterweed groundsel	Smooth aster
Common cowparsnip	1	0	Colorado columbine	Spreading sweetroot
Sweetanise	1	1	Engelmann aster	Sticky geranium
Showy goldeneye	1/2	1/2	Low goldenrod	Thickleaf peavine
			Nettleleaf gianthyssop	Utah peavine
			Northwestern painted-cup	Vegetable-oyster salsify
			Oregon checkermallow	

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Species	Shade	Openings	Alternate Species	
	-Pounds per acre-			
Shrubs:			Shrubs:	
Antelope bitter brush	0	1	Big sagebrush	Creeping barberry
Mountain snowberry	1	1/2	Bigtooth maple	Redberry elder
Rubber rabbitbrush	1	1/2	Blueberry elder	Woods rose
Totals	18	18		

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Table 3 . Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed wet and semi-wet meadows. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Semi-wet soil		Wet soil		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Semi-wet	Wet
-Pounds per acre-						
Grasses:					Grasses and Sedges:	
Reed canarygrass	4	2	8	4	Great Basin wildrye	Meadow barley
Meadow foxtail	3	1 1/2	2	1	Kentucky bluegrass	Ovalhead sedge
Redtop	1	1/2	1	1/2	Meadow barley	Tufted hairgrass
Smooth brome (northern strain)	3	1 1/2	0	0	Ovalhead sedge	
Timothy	1	1/2	1	1/2		
Forbs:					Forbs:	
Alsike clover	1	1/2	3	1 1/2	Alpine leafybract aster	Edible valerian
Strawberry clover	2	1	3	1 1/2	Pacific aster	Pacific aster
Black medick	2	1	0	0		
Oregon checkermallow	2	1	0	0		
Totals	19	9 1/2	18	9		

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Table 4. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed inland saltgrass stands typical of riparian sites in the desert scrub habitat of the cold desert ecological association. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Wet Lands		Dry Lands		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
-Pounds per acre-					
Grasses:					Grasses:
Russian wildrye	4	2	4	2	Alkali sacaton
Tall wheatgrass	2	1	1	1/2	Reed canarygrass
Fairway crested wheatgrass	0	0	2	1	Salina wildrye
Tall fescue	2	1	0	0	Slender wheatgrass
Great Basin wildrye	2	1	2	1	Meadow foxtail
					Quackgrass
Forbs:					Forbs:
Yellow sweetclover	4	2	4	2	Alfalfa (creeping strain or Ladak)
Strawberry clover	2	1	1	0	Black medick
Pacific aster	1	1/2	1	1/2	Fivehook bassia
					Belvedere summer cypress
Shrubs:					Shrubs:
Gardner saltbush	3	1 1/2	3	1 1/2	American plum
Fourwing saltbush	0	0	4	2	Russian-olive
					Silver buffaloberry
Totals	20	10	21	10 1/2	Purpleosier willow
					Rubber rabbitbrush
					Winterfat

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Table 5. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed shadscale stands typical of the desert scrub habitat of the cold desert ecological association. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Application		Alternate Species
	Broadcast	Drilled	
Grasses:			
Russian wildrye	1 1/2	1	
Fairway crested wheatgrass	1 1/2	1	
Standard crested wheatgrass	1 1/2	1	
Indian ricegrass	1 1/2	1	
Forbs:			
Gooseberryleaf globemallow	1 1/2	1	
Alfalfa	1 1/2	1	
Shrubs:			
Winterfat	1 1/2	1	
Fourwing saltbush	1 1/2	1	
Totals	12.	8	
Grasses:			
Alkali sacaton			Sand dropseed
Bottlebrush squirreltail			Spike dropseed
Salina wildrye			Bluestem wheatgrass
Forbs:			
Lewis (or blue) flax			Small burnet
Shrubs:			
Big sagebrush			Parry rabbitbrush
Black sagebrush			Rubber rabbitbrush
Bud sagebrush			Small rabbitbrush
Fringed sagebrush			Yellowbrush

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Table Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed blackbush stands typical of the desert scrub habitat of the cold desert ecological association. Also included are acceptable alternatives if seed for a plant species is not available. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Application		Alternate Species
	Broadcast	Drilled	
-Pounds per acre-			
Grasses:			Grasses:
Pubescent wheatgrass	2	1	Alkali sacaton
Intermediate wheatgrass	2	1	Orchardgrass (Mediterranean type)
Fairway crested wheatgrass	1	1/2	Bluestem wheatgrass
Sand dropseed	1	1/2	Standard crested wheatgrass
			Russian wildrye
			Spike dropseed
Forbs:			Forbs:
Alfalfa	2	1	Alfileria
Small burnet	3	1 1/2	German Iris
Gooseberryleaf globemallow	1	1/2	Lewis flax
			Nevada showy goldeneye
			Palmer penstemon
			Toadflax penstemon
Shrubs:			Shrubs:
Fourwing saltbush	5	2 1/2	Antelope bitterbrush
Winterfat	3	1 1/2	Apache-plume
			Cliffrose
			Desert bitterbrush
Totals	20	10	

108xvii



Table 7. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed alpine herblands or parklands of the montane ecological association. Also included are acceptable alternates if seed for a plant species is not available. Alternates marked with an asterisk (*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Well drained soils		Moist soils		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Well drained Soils	Moist Soils
Grasses:						
Smooth brome (northern strains)	3	1 1/2	4	2	Bearded wheatgrass	Kentucky bluegrass
Smooth brome (southern strains)	3	1 1/2	4	2	Hard sheep fescue	Meadow barley
Intermediate wheatgrass	1	1/2	0	0	Kentucky bluegrass	Meadow brome
Meadow foxtail	1	1/2	2	1	Slender wheatgrass	Ovalhead sedge
Subalpine brome	1	1/2	1	1/2	Sulcata sheep fescue	Timothy
Tall oatgrass	1	1/2	0	0	Timothy	
Orchardgrass (Intermountain area)	1	1/2	0	0		
Mountain brome	1	1/2	0	0		
Reed canarygrass	0	0	2	1		
Forbs:						
Alfalfa (creeping type or Ladak)	1	1/2	1	1/2	Lewis (or blue) flax	Alpine leafybract aster
Mountain lupine	2	1	2	1	Nuttall lomatium	Fat solomon-plume
Common cowparsnip	0	0	1	1/2	Oneflower	Low goldenrod
Sweetanise	1	1/2	1	1/2	hellanthella	Pacific aster
Chickpea milkvetch	2	1	0	0	Oregon fleabane	Edible valerian
					Porter ligusticum	
					Showy goldeneye	
					Silky lupine	
					Smooth aster	

108xviii

Species	<u>Well drained soils</u>		<u>Moist soils</u>		Alternate Species	
	Broadcast	Drilled	Broadcast	Drilled	Well drained Soils	Moist Soils
Shrubs:					Shrubs:	
Mountain snowberry	1	1/2	0	0	Big sagebrush	Bush cinquefoil
Yellowbrush	1	1/2	0	0	Bush cinquefoil	Geyer willow
					Parry rabbitbrush	Scouler willow
					Redberry elder	Silver sagebrush
					Rubber rabbitbrush	
					Silver sagebrush	
					Squaw currant	
					Sticky currant	
					Woods rose	
					Wyeth erlogonum	
Totals	20	10	18	9		

Table 9. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed sagebrush habitats of the submontane ecological association. Also included are acceptable alternatives if seed for a plant species is not available. Alternates marked with an asterisk (*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species	Precipitation less than 11 inches		Precipitation 11 inches or more		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
Grasses:					
Fairway crested wheatgrass	3	2	4	2	Grasses:
Standard crested wheatgrass	2	1	0	0	Alkali sacaton*
Bearded bluebunch wheatgrass	1/2	1/2	1	1/2	Bottlebrush squirreltail
Bluestem wheatgrass	1/2	1/2	1	1/2	Bulbous barley*
Intermediate wheatgrass	1/2	1/2	1	1	Bulbous bluegrass*
Pubescent wheatgrass	1/2	1	1	1	Great Basin wildrye
Russian wildrye	1	1	1	1	Hard sheep fescue*
					Indian ricegrass
					Orchardgrass*
					Sand dropseed*
					Siberian wheatgrass
					Smooth brome
					(southern strain)*
					Winter rye*
Forbs:					
Alfalfa (Rambler, Nomad or Ladak - equal amount of each)	1	1	1	1	Forbs:
Utah sweetvetch	0	0	1/2	1/2	Bouncing-bet*
Arrowleaf balsamroot	1/2	1/4	1/2	1/2	Cushion eriogonum*
Small burnet	0	0	1/2	1/2	Cutleaf balsamroot*
					Eaton penstemon*
					Goosebeard/ryeleaf globemallow*
					Lewis flax
					Louisiana sagebrush*
					Nevada lupine*
					Nevada showy goldeneye*
					Oneflower helianthella*
					Smooth aster*
					Vegetable-oyster salsify*
					Wasatch penstemon*
					Sicklepod milkvetch
Totals:	11	8-3/4	13	9-1/2	

Table 9 continued

Species	Precipitation less than 11 inches		Precipitation 11 inches or more		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
Shrubs:					
Shrubs for separate planting in major disturbance areas - pits, tractor cleat marks, and dozer scalps:					
Antelope bitterbrush	2	1	3	2	
Cliffrose or desert bitterbrush	1	1/2	1-1/2	1	
Fourwing saltbush	2	2	2	2	
Utah serviceberry	1	1	1	1	
Winterfat	1-1/2	1	1	1	
Totals:	7-1/2	5-1/2	8-1/2	7	
Shrubs:					
					Big sagebrush
					Black sagebrush
					Bud sagebrush*
					Desert peachbrush*
					Douglas rabbitbrush
					Gardner saltbush*
					Green ephedra
					Longflower snowberry*
					Martin ceanothus*
					Nevada ephedra
					Rocky Mountain smooth sumac*
					Spineless hopsage*
					Spiny hopsage*
					Squaw-apple*
					Wyeth eriogonum*

108xxi

Table 10. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed pinyon-juniper habitats of the submontane ecological association. Also included are acceptable alternatives if seed for a plant species is not available. Alternatives marked with an asterisk (*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Mosen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.

Species Mixture	Lower elevation (Precipitation less than 12 in.)		Upper elevation (Precipitation 12 in. or more)		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
Grasses:					
Fairway crested wheatgrass	4	2	3	1-1/2	Bearded or beardless blue-bunch wheatgrass
Standard crested wheatgrass	1	1	1	1/2	Mountain rye*
Bluestem wheatgrass	1	1/2	0	0	Orchardgrass
Intermediate wheatgrass	1	1/2	1	1	Bottlebrush squirreltail
Pubescent wheatgrass	1	1/2	1	1	Bulbous barley
Russian wildrye	1	1/2	1	1	Bulbous bluegrass
Smooth brome (southern strain)	0	0	1	1/2	Great Basin wildrye
				1	Hard fescue
					Indian ricegrass
					Meadow brome*
Grasses:					
					Sulcata sheep fescue
					Tall wheatgrass*
					Winter rye*
Forbs:					
Alfalfa (Rambler, Nomad, Travois, or Ladak - equal amount of each	1	1	2	1	Lewis' flax
Chickpea milkvetch	0	0	1	1/2	Nevada showy goldeneye
Utah sweetvetch	1	1/2	1	1/2	Nuttall lomatium
Yellow sweetclover	1	1/2	1	1/2	Pacific aster
Arrowleaf balsamroot	1	1/2	1	1/2	Showy goldeneye
Small burnet	1	1	1	1/2	Eaton penstemon*
				1	Gooseberryleaf globe- mallow*
					Louisiana sagebrush*
					Nevada lupine*
					Bouncing-bet*
					Bramble vetch*
					German iris*
					Cutleaf balsamroot*
					Sicklepod milkvetch
					Oneflower
					hellianthella *
					Palmer penstemon*
					Parry goldenrod*
					Silky lupine*
					Small aster*
					Tarragon sagebrush*
					Thickleaf penstemon
					Toadflax penstemon*
					Vegetable-oyster sally*
					Wasatch penstemon*

Table 10 Continued

Species Mixture	Lower elevation (Precipitation less than 12 in.)		Upper elevation (Precipitation 12 in. or more)		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
Shrubs:					
Big sagebrush	1	1/2	1	1/2	Shrubs: Nevada ephedra Littleleaf mountain- mahogany Squaw-apple Tatarian honeysuckle Apache-plume* Arizona cypress* Black common chokecherry* Blueberry elder* Common lilac* Desert peachbrush* Fringed sagebrush* Gardner saltbush*
Black sagebrush	1	1/2	1	1/2	
Rubber rabbitbrush	1	1/2	1	1/2	
Winterfat	1	1/2	1	1/2	
Fourwing saltbush	1	1	1	1	
Totals:	19	11-1/2	20	12-1/2	Longflower snowberry* Martin ceanothus* Mountain snowberry* Peking cotoneaster* Rocky Mountain smooth sumac Roundleaf buffalo- berry* Russian-olive* Siberian peashrub* Skunk bush sumac* Spineless hopsage* Spiny hopsage* Wyeth eriogonum*
Shrubs for pits, major disturb- ance areas, and tractor cleat marks by dribblers:					
Antelope bitterbrush	2	1	3	2	
Cliffrose or desert bitterbrush	1	1/2	0	0	
Fourwing saltbush	2	2	1-1/2	1	
Utah serviceberry	1	1/2	0	0	
Green ephedra	1	1/2	1	1	
Birchleaf mountain-mahogany	1	1/2	1-1/2	1	
Curleaf mountain-mahogany	1	1/2	1-1/2	1	
Woods rose	0	0	1	1	
Golden currant	0	0	1/2	1/4	
Totals:	9	5-1/2	10	7-1/4	

Table 11. Recommended seed mixtures and seedling or larger sized transplants that will benefit wildlife through enhancement of moderately disturbed riparian habitats characterized as upland stream side vegetation in the submontane ecological association. Also included are acceptable alternatives if seed for a plant species is not available.

Species	North exposures and shady areas		Sunny exposures (south, west, east,)		Mixture for tall mountain brush type, shaded sites.
	Broadcast	Drilled	Broadcast	Drilled	
-Pounds per acre-					
Grasses: (seed mixture, transplants are not practicable)			Grasses: (seed mixture, transplants not practicable)		
Fairway crested wheatgrass	2	1	2	1	Smooth brome (Southern strain) 5
Smooth brome (Southern Strains)	4	2	2	1	Fairway crested wheatgrass 1
Intermediate wheatgrass	4	2	2	1	Intermediate wheatgrass 3
Pubescent wheatgrass	0	0	2	1	Orchardgrass (Utah grown) 2
Bluestem wheatgrass	0	0	1	1/2	Tall oatgrass 1
Orchardgrass	1	1/2	1	1/2	Mountain brome 1
Russian wildrye	0	0	1	1/2	
Tall oatgrass	1	1/2	0	0	
Forbs: (seed mixture, transplants are not practicable)			Forbs: (seed mixture, transplants not practicable)		
Alfalfa (Nomad, Rambler, Travois, Ladak-equal parts)	2	1	2	1	Alfalfa (creeping strains or Ladak) 1
Chickpea milkvetch	0	0	1	1/2	Pacific aster 1/4
Utah Sweetvetch	0	0	1	1/2	Oneflower helianthella 1/2
Yellow sweetclover	0	0	1	1/2	Snowy goldeneye 1/4
Arrowleaf balsamroot	1	1/2	1	1/2	
Pacific aster	1	1/2	1	1/2	
Shrubs: (seed mixture, transplants not usually successful)					
Fourwing saltbrush	0	0	1	1/2	
Rubber Rabbitbrush	1/2	1/4	1/2	1/4	
Douglas Rabbitbrush	1/2	1/4	1/2	1/4	

Species	Any exposure
	Density per acre
Shrubs and Trees: (seedling or larger sized transplants)	
Big sagebrush	A mixture of all trees and shrubs so that one plant will be planted in every 50 square feet of disturbed area. This equals 1,000 plants per acre.
Antelope bitterbrush	
Golden currant	
Birchleaf mountain mahogany	
Curleaf mountain mahogany	
Cliffrose	
Green ephedra	
Woods rose	
Saskatoon serviceberry	
Narrow leaf cottonwood	
Bigtooth maple	
Rocky mountain maple	
Willow (use shoots or entire clumps from local area)	
Dogwood	
Birch	
Alder	

Table 11. Continued

Alternate Species for Upland Stream side Vegetation in the transition life zone

Grasses:

Bearded bluebunch wheatgrass
 Beardless bluebunch wheatgrass
 Big bluegrass*
 Bluestem wheatgrass
 Bottlebrush squirreltail*
 Bulbous barley*
 Bulbous bluegrass*

Great Basin wildrye
 Green needlegrass*
 Hard sheep fescue
 Indian ricegrass*
 Kentucky bluegrass*
 Meadow brome*
 Mountain rye*

Sand dropseed*
 Siberian wheatgrass
 Slender wheatgrass
 Standard crested wheatgrass
 Sulcata sheep fescue
 Tall wheatgrass*
 Winter rye*

Forbs:

American vetch*
 Bouncing-bet
 Bramble vetch*
 Common cowparsnip*
 Cutleaf balsamroot
 Eaton penstemon*
 German iris*
 Gooseberryleaf globemallow*
 Lewis (or blue) flax

Louisiana sagebrush*
 Low penstemon*
 Nevada showy goldeneye
 Nuttall lomatium
 Palmer penstemon*
 Parry goldenrod*
 Sicklepod milkvetch
 Sidehill penstemon*
 Silky lupine*

Small burnet
 Stream globemallow*
 Sweetanise*
 Tall milkvetch*
 Tarragon sagebrush*
 Thicketleaf penstemon*
 Toadflax penstemon*
 Wasatch penstemon*
 Cushion erlogonum*

Shrubs:

Apache-plume*
 Arizona cypress*
 Black common chokecherry*
 Black sagebrush
 Blueberry elder*
 Boxelder*
 Common bladdersenna*
 Common lilac*
 Creeping barberry*

Desert bitterbrush*
 Desert peachbrush*
 Dwarf rabbitbrush*
 Fringed sagebrush*
 Gambel oak*
 Gardner saltbush*
 Longflower snowberry*
 Martin ceanothus*
 Mountain snowberry*

Nevada ephedra*
 New Mexican forestiera*
 Oldman wormwood (stem cut-
 tings)*
 Parry rabbitbrush*
 Peking cotoneaster*
 Purpleosier willow*
 Redberry elder*
 Rocky Mountain sumac*

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Alternate Species for Upland stream side Vegetation in the transition life zone

Shrubs: (continued)

Rocky Mountain juniper*
Roundleaf buffaloberry*
Russian-olive*
Siberian peashrub*
Silver buffaloberry*

Skunk bush sumac*
Squaw apple*
Tatarian honeysuckle*
Utah serviceberry
Western virginsbower*

Winterfat*
Wyeth erlogonum
Yellowbrush

Table 12. Recommended guidelines for reclamation that utilizes only willow transplants to benefit wildlife through enhancement of moderately disturbed riparian habitats characterized as pure willow stands in the cold desert and submontane ecological associations.

1. If disturbance was only moderate, the density of willow should approximate a single transplanted stem in every 50 square feet of disturbed area; the willow plantings should be spaced 7 feet apart, this equals 1,000 plants per acre. Total reclamation should establish a willow planting in every four square feet of disturbed area; willow plantings should be spaced 2 feet apart, this equals 1,200 plants per acre.
2. Cut willow stems ranging between 1/4 and 1/2 inch in diameter from local wild stock. The stems must be about 18 inches long. Note that the cut should be made at a 30° angle to the stem so that a maximum of bared stem will be exposed to the soil when planted. Multiple cuttings can come from a singular stem as long as the integrity concerning which end goes into the ground is maintained. During the cutting phase of this operation take the necessary precautions to keep the end of the willow to be placed in the ground from drying (place in a bucket of water).
3. When planting, about 2/3 of the stem should be pushed into the soil and 1/3 should remain above ground.

Note: Best success in terms of survival is in sandy soil; success decreases in soils characterized as gravel. Willow stems larger than 1/2 inch in diameter also have shown a low survival rate.

APPENDIX 10-C
FISH AND WILDLIFE RESOURCES INFORMATION
AND
PROTECTION PLANS



Janet Lee Young, PhD.
Field Ornithologist
1592 North 1640 East
Logan, Utah 84321

February 26, 1981

PRICE RIVER COAL COMPANY
K. B. Hutchinson
P.O. Box 629
Helper, Utah 84526

Re: Report on Raptor Survey for Price River Coal Company, June 9-11, 1980.

Dear K. B. Hutchinson:

Enclosed is my rewritten report which specifically addresses the four topics you requested.

Yes, it would be possible for me to work one day in late March and one day in early April to observe eagles. Also, at that time I would be able to survey for old platform nests before the trees leaf out. In addition I would like to play recordings of the Flammulated Owl and the Spotted Owl after dark.

Sincerely yours,

Janet Lee Young

Report on Avian Survey Conducted 9-11 June 1980

for Price River Coal Company

Four raptor species and 23 additional avian species were observed within a one kilometer radius of the proposed shaft site and along the proposed power line (see map) during the twenty hours I spent on the area over the three day period. The weather was excellent for observing as all three days were clear and sunny. The area included changes in elevation from approximately 6,600 to 8,000 feet and thus contained a variety of habitats for birds.

METHODS

The survey was conducted on the ground by foot. Field equipment included 10x50 binoculars, spotting scope, topographic map, clipboard with notepad, watch, and compass. All avian species were recorded as encountered. I determined the potential nesting sites (rock-outcroppings, snags, dense conifer stands, clumps of trees and cavities) while on the study area. I hiked to or observed with binoculars all potentially suitable nesting habitat. I followed the proposed power line outside of the kilometer circle from pole #10 to pole #3. From marker #3 I observed the remaining area to the connecting power line. The area within the kilometer circle and south of the access road was covered by foot. The area to the north of the access road was observed with binoculars from the canyon floor along the road and also from the ridge to the south (8,000'). I hiked out of the area above the access road to a point overlooking the highway, railroad and the Price River. I then dropped down to the access road and hiked back to the proposed shaft site. I scanned the tree tops, rock out-croppings and the horizon to both sides of the road as I hiked.

While on the study area I looked for field marks indicating the presence of raptorial birds as well as the birds themselves. I searched for suitable nest sites, old platform nests, feathers under a plucking perch, down, molted flight feathers, white marks on trunks, branches or rocks, regurgitated pellets, etc.. I watched for trees, either living or dead, which contained woodpecker or flicker holes or any type of natural cavity created by accident or decay. On an individual tree basis, I used a stick to strike the trunk of trees that contained a hole or cavity while I watched the hole for the appearance of a small owl. If a bird did not appear I assumed one was not present and that the cavity *probably* was not being used for nesting or roosting. Because of the lateness of the nesting season I did not use

any recordings of owl hoots or calls. Most owls will respond to recordings earlier in the nesting cycle during the period of breeding and egg-laying.

RESULTS

The bird species list and raptorial bird sightings are given in Table 1. The Turkey Vulture sightings occurred at 4:20 p.m. on June 9, seven birds; 4:00 p.m. on June 10, five birds; and 10:00 a.m., June 11, two birds. The Goshawk was sighted at mid day (12:30 p.m.) on June 10. One Red-tailed Hawk sighting was made at 5:30 p.m. on June 9, and the other at 11:40 a.m., June 10. The Common Raven flew over at 12:10 p.m. on June 10.

The birds of high federal interest for the Uinta-Southwestern Utah coal production region are given in Table 2. No birds from this list were observed during the twenty observation hours on the study area.

There was no evidence of old nests in the immediate shaft site area. No old platform nests were found on the study area. The area should be checked again in the early spring of 1981 before the aspen trees leaf out. No active nests and no old nests were observed along the access road nor along the proposed power line.

DISCUSSION

All of the migratory birds of high federal interest occur on the bird list for the Moab BLM District. However, the habitat types present in the district are highly diversified and the area includes southeastern Utah where the predominant biotic community is semi-arid desert. The study site is at the northern edge of the Moab BLM District, therefore the normal status ratings for the birds (Table 2) do not readily apply.

Winter habitat requirements for the Bald Eagle include a large river, lake or open reservoir which is not available on the study site. The area would only be suitable for a roost site if an adequate food supply was near.

There is suitable habitat for the Golden Eagle. Further observations will be made in March and April of 1981 to determine if there is nesting in the area. There is potential winter habitat for the Peregrin and Merlin. The stream provides suitable riparian habitat for the Cooper's Hawk. The area does not contain the preferred habitat of the Osprey (dead snags surrounded by water) however, it could be potential habitat if an adequate food supply was within a mile or so. There is suitable habitat for the Spotted Owl and the Flammulated Owl. Recordings should be used early in the 1981 season to determine their presence. There is also suitable habitat for the Williamson's Sapsucker.

TABLE 1. Bird species list and raptorial bird sightings.

Bird Species Observed

- White-throated Swift (*Aeronautes saxatalis*)
 Broad-tailed Hummingbird (*Selasphorus platycercus*)
 Empidonax Flycatcher (*Empidonax* sp.)
 Western Wood Pewee (*Contopus sordidulus*)
 Violet-green Swallow (*Tachycineta thalassina*)
 Steller's Jay (*Cyanocitta stelleri*)
 Mountain Chickadee (*Parus gambeli*)
 White-breasted Nuthatch (*Sitta carolinensis*)
 Rock Wren (*Salpinctes obsoletus*)
 Swainson's Thrush (*Catharus ustulatus*)
 Golden-crowned Kinglet (*Regulus satrapa*)
 Ruby-crowned Kinglet (*Regulus calendula*)
 Warbling Vireo (*Vireo gilvus*)
 Orange-crowned Warbler (*Vermivora celata*)
 Yellow Warbler (*Dendroica petechia*)
 Yellow-rumped (Audubon's) Warbler (*Dendroica coronata*)
 Western Tanager (*Piranga ludoviciana*)
 Black-headed Grosbeak (*Phaeoicticus melanocephalus*)
 Pine Siskin (*Spinus pinus*)
 Green-tailed Towhee (*Chlorura chlorura*)
 Rufous-sided Towhee (*Pipilo erythrophthalmus*)
 Gray-headed Junco (*Junco cariceps*)
 Chipping Sparrow (*Spizella passerina*)

Number of sightings (one sighting = observation of one bird until it disappeared from view) of raptorial birds during 20 hours spent on the study area 9-11 June 1980, and the estimated number of individuals using the area.

<u>Species</u>	<u>No. of sightings</u>	<u>Estimated no. of individuals</u>
Turkey Vulture (<i>Cathartes aura</i>)	14	7 adults
Goshawk (<i>Accipiter gentilis</i>)	1	1 adult
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	2	1 adult
Common Raven (<i>Corvus corax</i>)	1	1
TOTALS for four species	18	10

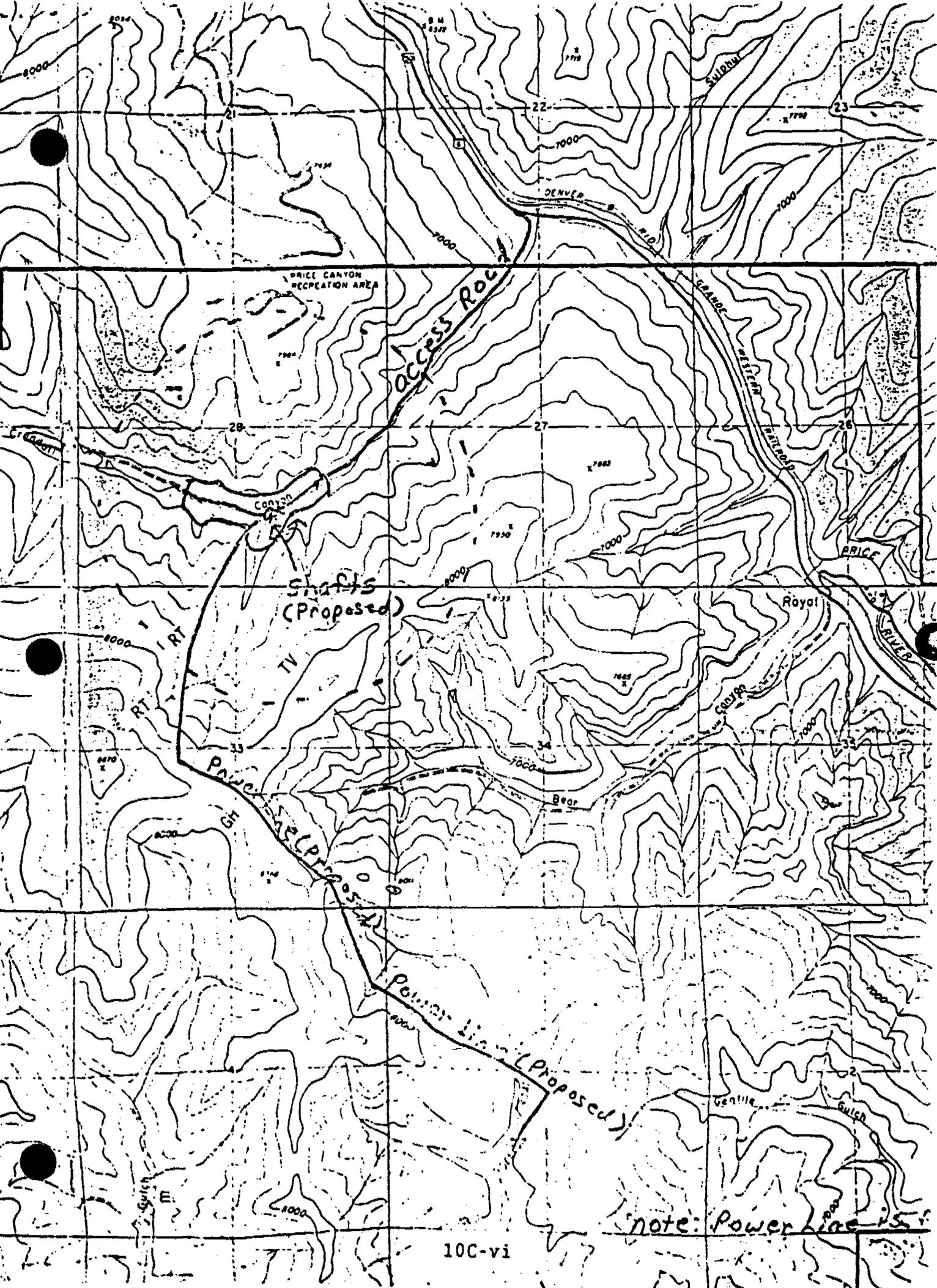
TABLE 2. Migratory birds of high federal interest for the Uinta-Southwestern Utah coal production region and their status in the Moab BLM District.

Species	Status
Bald eagle	uncommon winter visitant
Golden eagle	common permanent resident
Peregrine	rare permanent resident
Prairie falcon	common permanent resident
Ferruginous hawk	common summer resident
Merlin	uncommon winter visitant
Cooper's hawk	common permanent resident
Osprey	rare summer resident
Spotted owl	rare permanent resident
Burrowing owl	uncommon permanent resident
Flammulated owl	uncommon permanent resident
Pileated woodpecker	rare permanent resident
Williamson's sapsucker	uncommon summer resident
Lewis' woodpecker	uncommon permanent resident
Great blue heron	common permanent resident
Long-billed curlew	uncommon summer resident
Band-tailed pigeon	uncommon permanent resident
Sandhill crane	uncommon transient
Black swift	uncommon summer resident
Western bluebird	common summer resident
Scott's oriole	rare summer resident
Grace's warbler	common summer resident

submitted by:



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PRICE CANYON RECREATION AREA

Access Road

Shafis (Proposed)

Power Line (Proposed)

Power Line (Proposed)

DENVER

Royal

Gentle

Gulch

note: Power line is

REPORT ON RAPTOR SURVEY FOR PRICE RIVER COAL COMPANY

31 MARCH-1 APRIL AND 13-14 APRIL 1981

AT THE CRANDALL CANYON SITE.

Janet Lee Young, Ph.D.

The Crandall Canyon Site was revisited as a follow-up of the 1980 survey to observe any indication of nesting activity by eagles. In addition, recordings of the Flammulated Owl (*Otus flammeolus*) and the Spotted Owl (*Strix occidentalis*) were played after dark. A survey also was made for old platform nests and new nests before the trees leafed out for the year.

Methods

The survey was conducted on the ground by foot. Field equipment included Trinovid Leitz 10 x 40 binoculars, The Discoverer Bausch & Lomb Zoom 60 mm telescope, topographic map, compass, field notebook, Norelco tape recorder, and watch. All avian species were recorded as encountered. I determined the potential nesting sites (rock-outcroppings, snags, dense conifer stands, clumps of trees, and cavities) while on the study area. I hiked to or observed with binoculars all potentially suitable nesting habitats.

I looked for field marks indicating the presence of raptorial birds as well as the birds themselves. I searched for suitable nest sites, old platform nests, feathers under a plucking perch, down, molted flight feathers, white marks on trunks, branches or rocks, regurgitated pellets, etc. I watched for trees, either living or dead, which contained woodpecker or flicker holes or any type of natural cavity created by accident or decay.

At dusk and night I played tapes of the owl calls to solicit responses from the specific species. I played the tape of the Flammulated Owl (the smaller of the two species) first and later played the call of the larger owl. I played the recording at likely looking spots and then waited for a few minutes for a response.

On 31 March 1981, I hiked in on the access road and searched for old platform nests and new nests. Stick nests are quite visible in the spring before the trees leaf out. I scanned the tree tops, rock-outcroppings, and the horizon to both sides of the road as I hiked. After dark I played the owl recordings.

The first of April I drove in on the access road and hiked around the surface facility site and continued up Crandall Canyon. I expanded the one-kilometer radius (see 1980 map) from the center of the proposed site to a kilometer buffer zone around the disturbed area (see 1981 map). I climbed the drainage to the north and west of the site and observed the ridges, rock-outcroppings, and slopes above the proposed mine site. In 1980 observations were concentrated on the south side of the access road and the south and west and east of the proposed site. At this time those north-facing slopes were still snow covered and not being utilized by the observed birds.

On 13 April 1981, I parked at the locked gate to the Price Canyon Recreation Area access road. I hiked in on the three-mile road and scanned the ridges and horizon for Golden Eagle activity. Just beyond the scenic overlook on top I hiked to a point where I could look down on the proposed mine site. At dusk I played the Flammulated Owl recording along the top and around the camping area. I later switched to the Spotted Owl recording. I hiked back to my truck and drove to the Crandall Canyon access road. I parked at the locked gate and hiked in. On the way in on the access road I played the Flammulated Owl recording every few hundred feet and waited for a response. I hiked to beyond the disturbance area, then played the Spotted Owl recording at intervals on the way out.

I again hiked in to the Price Canyon Recreation Area on 14 April 1981 and made observations from above the proposed mine site. Over the four days I spent twenty-four hours on the study area: 6:00-8:30 p.m., 31 March; 8:00 a.m.-4:30 p.m., 1 April; and 8:30 a.m.-3:30 p.m., 14 April 1981. The weather all four days was good for observations, varying from sunny and clear to partly cloudy.

Results

Four raptor and 13 additional avian species were observed on the study area (Table 1). The Golden Eagle was the only species of high federal interest observed. The status of the Golden Eagle is "common permanent resident" in the Moab BLM District.

On the maps the strings of circles (ooooo) show approximate hiking paths. Too many routes were covered to be included on the map, however, and indication of observation points is given. The area north of the road and north and west of the proposed site was observed both from the canyon floor and from above in 1981. Circled abbreviations on the map indicate the bird was seen whereas a rectangle around abbreviations indicates the bird was heard in that approximate location. Arrows indicate the flight path of observed birds.

Golden Eagle

A Golden Eagle was sighted at 8:27 and 8:30 a.m. 1 April, marked GE on the map. Both sightings were very brief and against white sky, thus the age of the individual was not determined. At 8:30 a.m. a Golden Eagle and a Red-tailed Hawk were both visible. The Red-tailed Hawk was flying behind and to the west of the eagle. Both birds flew from view above the rocks to the north of the road. There was no observable interaction between the two species. At 12:10 p.m. on 1 April an immature Golden Eagle flew over the ridge above the campground area, across the drainage north and west of the proposed mine site and out of view to the west (Im. GE on map). On 14 April an adult Golden Eagle (A. GE on map) came over the ridge top above the campground area and dropped down toward the mine site. The eagle was in rapid flight. No other eagle sightings were made.

Red-tailed Hawk

The first Red-tailed Hawk sighting was at 8:20 a.m. 1 April. The bird was soaring over the large cleared area above the road toward the west end of the disturbance area. At 8:30 a.m. the Red-tailed Hawk was again seen when the Golden Eagle was in view. At 11:56 a.m. I was observing from the west side of the drainage north and west of the proposed site when a pair of Red-tailed Hawks flew in from the west. The female landed on the top of a large snag along the ridge line across the drainage from me (RT on map). The male mounted the female, copulated, and flew east over

the ridge. At 12:02 the female also flew from view to the east. At 12:17 a Red-tailed Hawk landed on the top of a snag next to the snag which had previously been used for mating. At 12:21 the Red-tailed Hawk dropped out of view to the east. On 14 April a Red-tailed Hawk was in a snag, same location as 1 April, at 12:23 p.m. The bird dropped out of view to the west as I approached from the east. The nest was not located.

Turkey Vulture

All Turkey Vulture sightings were made on 14 April from the Price Canyon Recreation Area. At 11:19-11:21 a.m. a T.V. flew in from across the canyon and circled above the ridge containing the snags used by the Red-tailed Hawks (TV on Map). At 11:22 it was seen again soaring. It was soaring and circling again at 12:58, 12:59, and 1:01 p.m. At 1:03 p.m. it flew toward the proposed mine site and out of view.

Great Horned Owl

On 31 March at 7:05 p.m. I heard a Great Horned Owl calling up Crandall Canyon (GHO on map). At 7:10 a.m. I played the Flammulated Owl recording just beyond the west end of the disturbed area. At 7:20 p.m. the GHO was attracted by the small owl recording and moved in closer. It continued calling from the conifers across the road from me. On 13 April a GHO was called into the conifers behind the trailers in response to the Spotted Owl recording at 10:00 p.m. The GHO was still calling at 10:20 p.m. No sightings were made of the owl during daylight.

Survey for Platform Nests

On 31 March and 1 April I hiked along the access road and looked for platform nests in the trees (the trees were not leafed out). No old platform and no new nests were found. I searched for platform nests while hiking around the disturbance area and on top on 13 and 14 April. No nests were found.

Flammulated Owl and Spotted Owl Recordings

There was no response by the specific species to the recordings played after dark on 31 March and 13 April.

Discussion

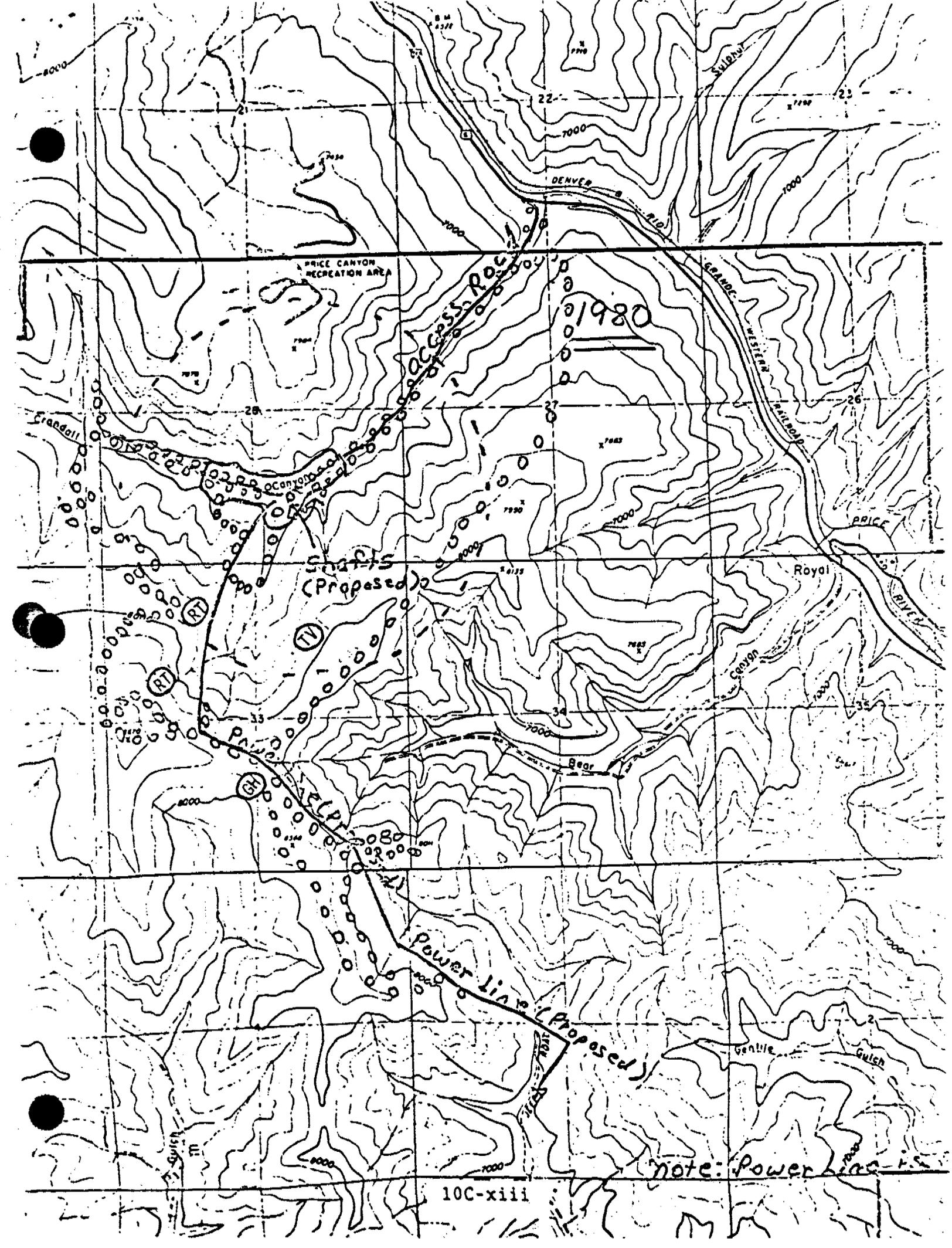
The Crandall Canyon Site was revisited in 1981 to observe Golden Eagle nesting activity. From the behavior of the eagles observed, there was no indication of nesting in the area. In Utah Golden Eagles should be incubating at this time of year (Eyre and Paul 1973). There was no indication of a pair of adults in the area. The rapid flight of the adult bird observed suggests the bird was probably hunting. Since each Golden Eagle pair may require 20 to 30 square miles of territory (Eyre and Paul 1973), the nest site could be at a considerable distance. However, not all adults nest each year (Terres 1980). Golden Eagle nests generally are visible from some distance, appearing as large (eight to ten feet across and three to four feet thick, or more) objects on cliffs (Call 1978). No active and no inactive nest sites were found. The immature bird would not have been breeding. The proposed Crandall Canyon mine site should not be considered "high priority habitat" for the Golden Eagle.

Literature Cited

- Call, Mayo W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. Technical Note TN-316, Bureau of Land Management, Denver Service Center.
- Eyre, L. and D. Paul. 1973. Raptors of Utah. Utah Division of Wildlife Resources Publication No. 73-7.
- Terres, John K. 1980. The Audubon Society Encyclopedia of North American Birds. Alfred A. Knoph, New York.

TABLE 1. Bird Species Observed

Turkey Vulture (*Cathartes aura*)
Red-tailed Hawk (*Buteo jamaicensis*)
Golden Eagle (*Aquila chrysaetos*)
Blue Grouse (*Dendragapus obscurus*)
Great Horned Owl (*Bubo virginianus*)
Yellow-bellied Sapsucker (*Sphyrapicus varius*)
Steller's Jay (*Cyanocitta stelleri*)
Clark's Nutcracker (*Nucifraga columbiana*)
Mountain Chickadee (*Parus gambeli*)
Canyon Wren (*Catherpes mexicanus*)
American Robin (*Turdus migratorius*)
Mountain Bluebird (*Sialia currucoides*)
Townsend's Solitaire (*Myadestes townsendi*)
Pine Siskin (*Spinus Pinus*)
Dark-eyed Junco (*Junco hyemalis*)
Gray-headed Junco (*Junco caniceps*)
Song Sparrow (*Melospiza melodia*)



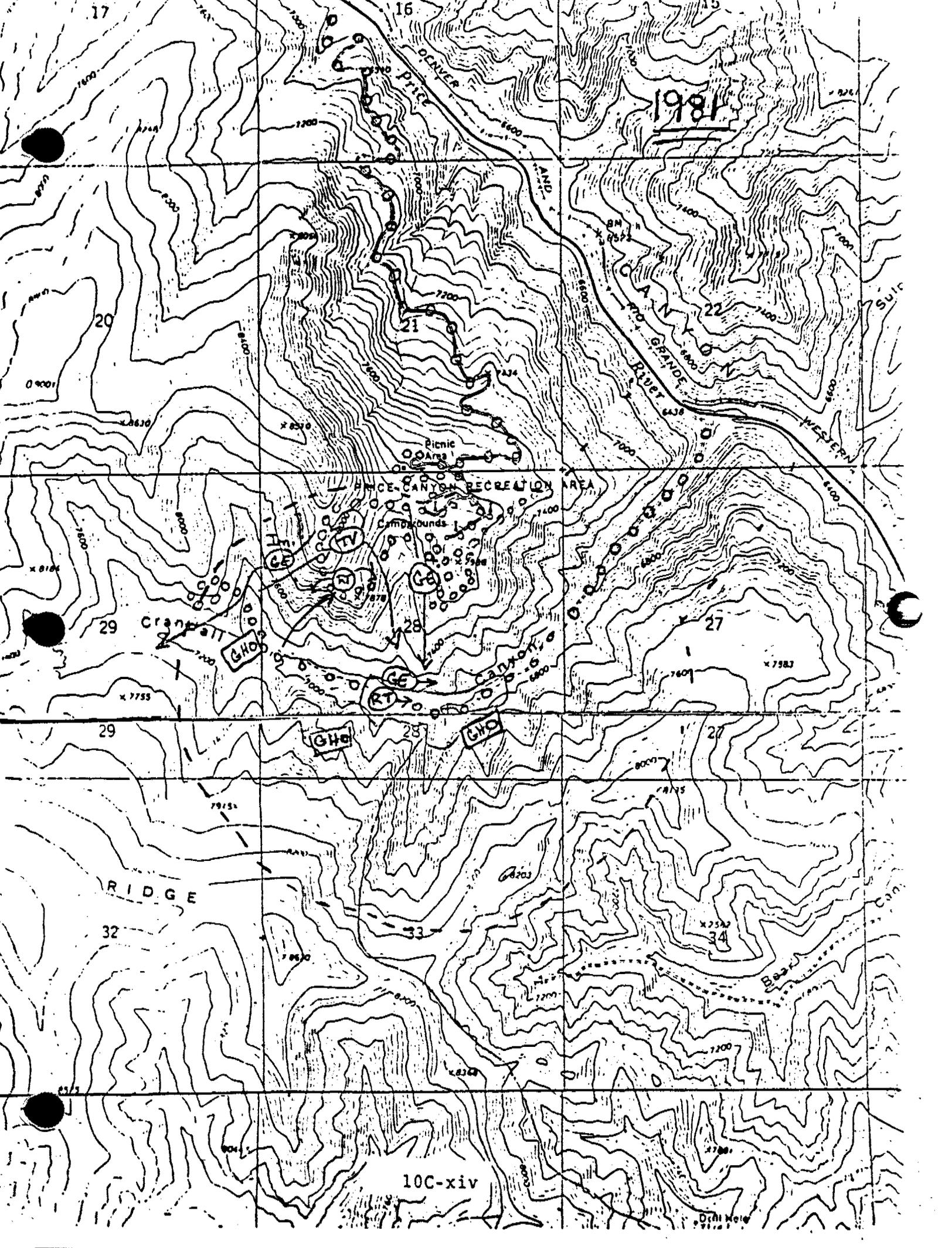
PRICE CANYON RECREATION AREA

08/1980

Sharts (Proposed)

Power Line (Proposed)

note: Power Line is...



1981

PRICE CANYON RECREATION AREA

CRANFALL CANYON

10C-xiv

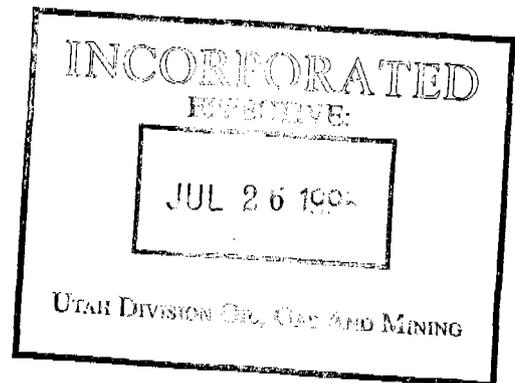
D. H. Nole
V. 17

APPENDIX 10-D

FISH AND WILDLIFE RESOURCES INFORMATION

AND

PROTECTION PLANS



SURVEY FOR MIGRATORY BIRDS AND THEIR HIGH PRIORITY HABITATS

HAVING HIGH FEDERAL INTEREST

-- CRANDAL CANYON POWER LINE --

Charles L. Greenwood
Wildlife Biologist

Due to recommendations by the Division of Oil, Gas, and Mining to Price River Coal Company, dated December 22, 1980, it has become necessary to conduct an avian survey. Such a survey was to determine the presence or absence of migratory birds and their high priority habitats, pursuant to 43 CFR 3461.1 (n-1), along the proposed Hardscrabble Canyon to Crandal Canyon electric transmission line. This work is the third and final segment relative to the transmission line. Note that Janet Young conducted field work and prepared reports for the other segments.

INCORPORATED
RESERVE:

JUL 26 1985

METHODS

A literature survey was conducted to determine if any of the avian species listed in appendix A are known to inhabit the Wasatch Plateau.

A field inventory conducted as an on the ground survey on June 20, 1981 was performed in order to determine the presence of high priority habitats of the avian species having high Federal interest that are known to inhabit the Wasatch Plateau. If, during the field inventory, an avian species having high Federal interest which was not known to inhabit the

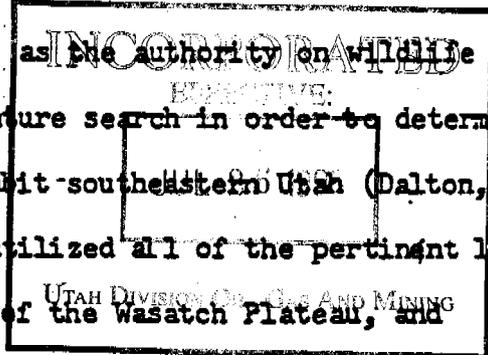
Wasatch Plateau was observed, it would be documented and a determination made relative to its high priority habitats.

Field equipment used to conduct the survey included 7 X 35 Binoculars, field notebook and topographic maps.

While surveying the proposed electric transmission line, evidence of avian species having high Federal interest, were searched for. The area searched was the alignment flagged and marked on the ground by the Price River Coal Company. When necessary, various vantage points were used in order to appropriately observe the avifauna.

RESULTS

The Utah Division of Wildlife Resources, as the authority on wildlife in the State of Utah has conducted a literature search in order to determine species of vertebrate wildlife that inhabit southeastern Utah (Dalton, et al., 1978). Since this work is recent and utilized all of the pertinent literature relative to wildlife inhabitation of the Wasatch Plateau, and represents a compilation of agency and institution files, no other literature was searched.



The following avian species having high Federal interest are known to inhabit the Wasatch Plateau:

Bald Eagle (Haliaeetus leucocephalus) - This bird's status is endangered and it is a winter resident. Due to the bird's season of use, survey for this species or its habitat was not conducted. An adequate description

of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, Page 13 and 14 of UMC 783.20; Fish and Wildlife Resource Information.

Golden Eagle (Aquila chrysaetos) - This bird's status is common and it is a yearlong resident. An on the ground survey was conducted for this species. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, Page 13 of UMC 783.20; Fish and Wildlife Resource Information.

Peregrine Falcon (Falco peregrinus) - The American peregrine falcon is endangered and it is a yearlong resident. The arctic peregrine falcon is also endangered and it is a winter resident. Due to these birds' season of use, survey for only the American peregrine falcon and its habitat was conducted. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, Page 14 of UMC 783.20; Fish and Wildlife Resource Information.

Ferruginous Hawk (Buteo regalis) - This bird's status is uncommon as a summer resident and rare as a winter resident. Due to the bird's habitat use area, survey for this species or its habitat was not conducted.

Merlin (Falco columbarius) - This bird's status is unknown and it is a winter resident. Due to the bird's habitat use area, survey for this species or its habitat was not conducted.

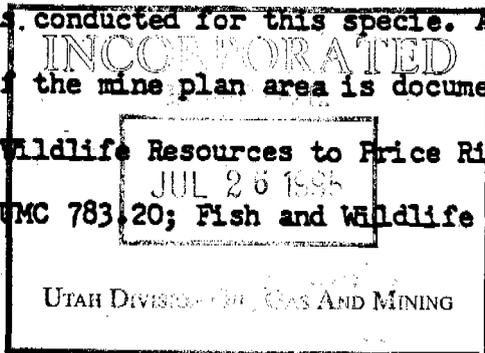
Cooper's hawk (Accipiter cooperii) - This bird's status is common as a summer resident and rare as a winter resident. An on the ground survey was conducted for this specie.

Osprey (Pandion haliaetus) - This bird's status is uncommon and it is a transient. Due to the bird's habitat use area, survey for this specie or its habitat was not conducted.

Burrowing owl (Speotyto cunicularia) - This bird's status is limited and it is a resident. Due to the bird's habitat use area, survey for this specie or its habitat was not conducted.

Flammulated owl (Otus flammeolus) - This bird's status is unknown and it is a summer resident. An on the ground survey was conducted for this specie.

Great blue heron (Ardea herodias) - This bird's status is unknown and it is a resident. An on the ground survey was conducted for this specie. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, page 11 of UMC 783.20; Fish and Wildlife Information.



Long-billed curlew (Numerius americanus) - This bird's status is unknown and it is a summer resident and transient. Due to the bird's habitat use area, survey for this specie or its habitat was not conducted.

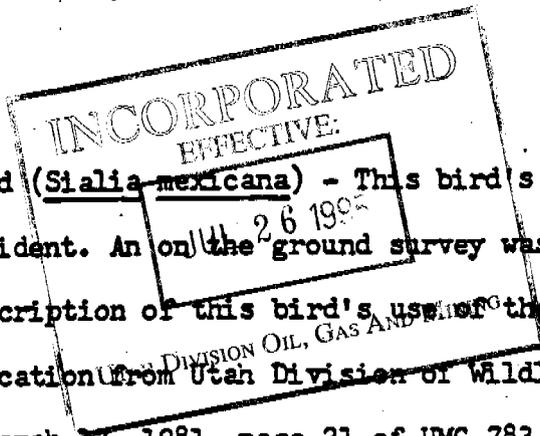
Band-tailed pigeon (Columba fasciata) - This bird's status is uncommon

and it is a summer resident and transient. An on the ground survey was conducted for this specie. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Wildlife Resources to Price River Coal Company, March 17, 1981, page 18 and 19 of UMC 783.20; Fish and Wildlife Resource Information.

Sandhill crane (Grus canadensis) - This bird's status is limited and it is a transient. Due to the bird's habitat use area, survey for this specie or its habitat was not conducted.

Black swift (Cypseloides niger) - This bird's status is uncommon and it is a summer resident. An on the ground survey was conducted for this specie. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, page 19 of UMC 783.20; Fish and Wildlife Information.

Western bluebird (Sialia mexicana) - This bird's status is unknown and it is a summer resident. An on the ground survey was conducted for this specie. An adequate description of this bird's use of the mine plan area is documented in a communication from Utah Division of Wildlife Resources to Price River Coal Company, March 17, 1981, page 21 of UMC 783.20; Fish and Wildlife Resource Information.



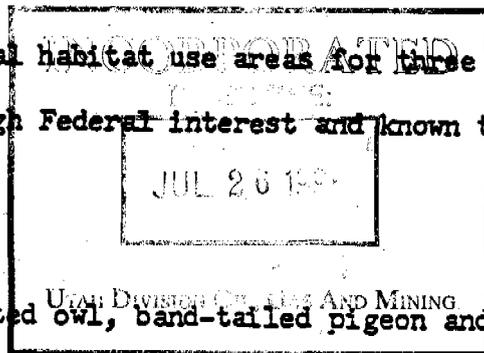
The on the ground survey documented the presence of three avian species having high Federal interest that are known to inhabit the Wasatch Plateau.

A pair of Cooper's hawks were documented at 9:00 A.M. circling and hunting the canyon South of the Crandal Canyon portal area, between proposed power line poles # 11 and 13 (T. 12 S., R. 9 E., Sec. 33). This section contains potential nesting habitat for the Cooper's hawk, but the survey did not reveal an aerie.

A pair of golden eagles were documented at 12:15 P.M. circling above Hardscrabble Canyon between proposed power line poles #1 and 4 (T. 13 S., R. 9 E., Sec. 3). Rock out-croppings are located proximal to these sections of the proposed power line, but the survey did not reveal an aerie.

Streaked mite, typical of that associated with prairie falcon activity, was documented in Hardscrabble Canyon (T. 13 S., R. 9 E., Sec. 3, NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of NW $\frac{1}{4}$). But no prairie falcons were documented. This activity area has been plotted on the attached map.

The survey also documented potential habitat use areas for three additional species of avian species having high Federal interest and known to inhabit the Wasatch Plateau.



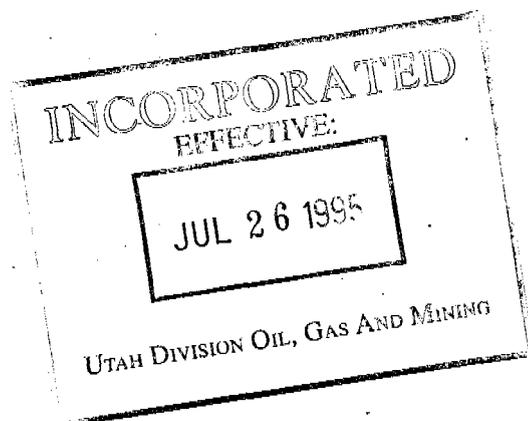
Potential habitat for the flammulated owl, band-tailed pigeon and western bluebird was documented along the proposed power line route (T. 13 S., R. 9 E., Sec. 3 and 4, and T. 12 S., R. 9 E., Sec. 33 and 28). This potential habitat consisted of the pine and fir forests encountered at various points along the proposed power line route, especially along the North and East facing slopes.

CONCLUSIONS

This limited on the ground survey of the proposed power line did not reveal any existing high priority habitat for the aforementioned avian species. Although a total of three avian species of high Federal interest were documented during the survey and potential habitat for three additional avian species was documented, no limited environmental factors, as outlined in appendix A (page 2), were documented for these avian species of high Federal interest.

LITERATURE CITED

Dalton, L. B., C. B. Farnsworth, R. B. Smith, R. C. Wallace, R. B. Winegardner. 1978. Species List of Vertebrate Wildlife That Inhabit South-eastern Utah. Utah State Division of Wildlife Resources. Publication No. 78-16. 68 pp.





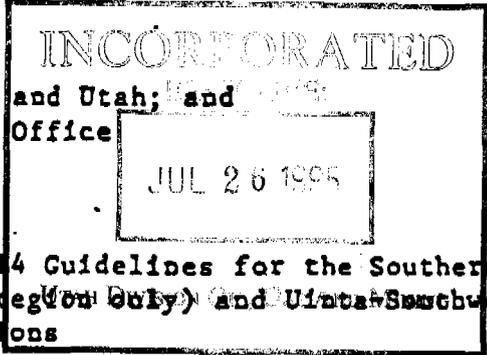
United States Department of the Interior

BUREAU OF LAND MANAGEMENT

WASHINGTON, D.C. 20240

Instruction Memorandum No. 80-
Expires 9/30/80

To: SD's - Colorado, Nevada,
Director, Eastern States



From: Associate Director

Subject: Unsuitability Criterion 14 Guidelines for the Southern
Appalachian (Alabama Subregion Only) and Uinta-Southwestern
Utah Coal Production Regions

This instruction memorandum establishes a list of "migratory bird species of high Federal interest on a regional and national level" and the definition of "high priority habitat" for these species for the above-indicated coal production regions. The species list and habitat definition were prepared jointly by the Fish and Wildlife Service and the Bureau, in accordance with Unsuitability Criterion 14 of the Final Rulemaking on Coal Management; Federally Owned Coal (43 CFR 3461.1(n)(1)). Any questions on this information should be directed to Jim Young (FTS 343-7911) or Jim Ruos (FTS 254-3207) of the Service or Denise Meridith (FTS 343-6188) or Don Brabson (FTS 343-4537) of the Bureau.

The species list and habitat definition are to be utilized during activity planning for potential 1981 coal lease sales for these regions. They are germane to the unsuitability criteria application on delineated tracts. The results of the application of this migratory bird criterion are to be documented in the site-specific analyses on delineated tracts and the regional coal lease sale environmental impact statements.

The species listed in Enclosure 1 and 2 are the species from the Alabama subregion and Uinta-Southwestern Utah region, respectively, applicable to this criterion. These lists represent the high Federal interest migratory birds on a regional and national level from the national perspective. It can be modified from a regional perspective, as considered appropriate through the respective Regional Coal Team, in consultation with the Fish and Wildlife Service. The Service's ex-officio Regional Coal Team member is the appropriate contact for discussion of regional modification of the species list. All recommendations for modification must be submitted to the Bureau's Director for an ultimate decision.

High priority habitat is an area containing one or more limited environmental factors needed to support a population of at least one of the listed species. All high priority habitat must meet the following criteria:

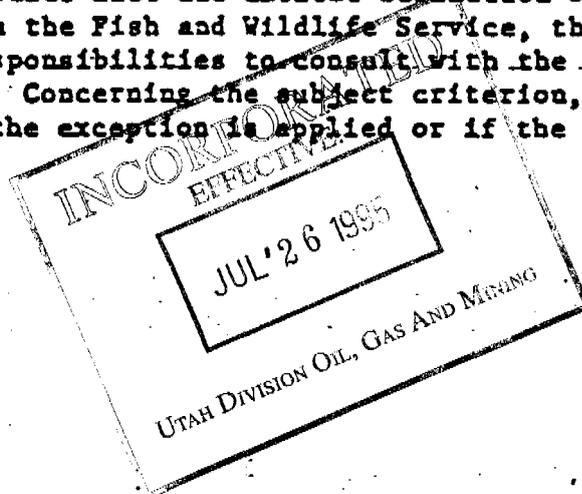
- (1) It must be used regularly (though use can be confined to one season during the year) by one or more of the listed species.
- (2) Its availability for uses such as feeding, reproduction, nesting, molting and/or wintering must be either (a) limited, or (b) supportive of concentrations, of a listed species in the indicated coal region or subregion.
- (3) It must contain a combination of natural or manmade factors (e.g. riparian vegetation, reservoirs, cliff sites, tall building, etc.) that provide an essential quantity or quality of one or more of the habitat requirements of a listed species: food, water, cover, or space.

Examples of high priority habitat may include:

- Yellow-crowned night heron rookeries
- Osprey concentrations areas
- Black swift colonies-

~~It should be noted that in order to assess an area as being unsuitable for all or certain stipulated methods of coal mining, both the "high Federal interest" and the "high priority habitat" aspects of this criterion must be met. That is any unsuitable area must support species listed on Enclosure 1 or 2 and contain habitat of these species which meets all three of the above-indicated habitat criteria.~~

Although this species list and habitat definition were developed in consultation with the Fish and Wildlife Service, this does not relieve the Bureau of its responsibilities to consult with the Service, pursuant to 43 CFR 3461.3-2. Concerning the subject criterion, this consultation is mandatory if the exception is applied or if the enclosed species list is modified.



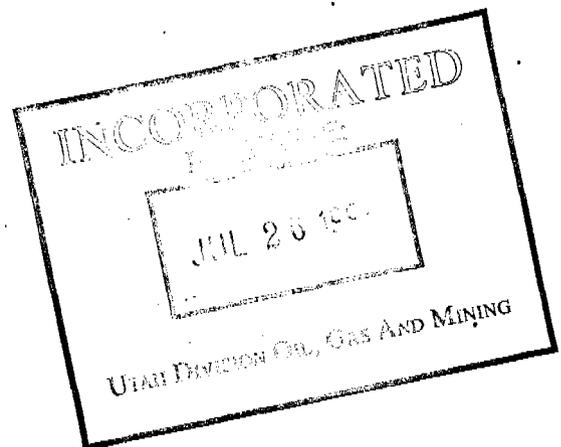
Enclosures

Encl. 2 - Migratory Birds of High Federal Interest
Utah-Southwestern Utah Coal Production Region

Migratory Birds of High Federal Interest
Uinta-Southwestern Utah Coal Production Region

Bald eagle
Golden eagle
Peregrine
Prairie falcon
Ferruginous hawk
Merlin
Cooper's hawk
Osprey
Spotted owl
Burrowing owl
Flammulated owl

Pileated woodpecker
Williamson's sapsucker
Lewis' woodpecker
Great blue heron
Long-billed curlew
Band-tailed pigeon
Sandhill crane
Black swift
Western bluebird
Scott's oriole
Grace's warbler



Enclosure 2

STANDARDVILLE QUADRANGLE
UTAH-CARBON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW 1/4 CASTLE GATE 15' QUADRANGLE

3863 IV SE
IMATS SUMMIT

107 55' 108 217000 FEET 109 SOLDIER SUMMIT 17 MI. 110 110°52'30" 39°45'



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498
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FEET
T 13 S

497

496

42°30"

495

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494

Charles L. Greenwood, Wildlife Biologist
P.O. Box 493 Wellington, Utah 84542

EDUCATION

Bachelor of Science in Wildlife Science from Utah State University,
June 1979

PROFESSIONAL EXPERIENCE

Wildlife Biologist (19-1) For the Utah Division of Wildlife Resources (UDWR).
Coal - Wildlife Study. Price, Utah. May 1981 - Present.

Resource Biologist (17-2) For UDWR. Coal- Wildlife Study. Price, Utah.
December 1979 - May 1981.

Biological Aide (11-4) For UDWR. Mule deer fawn mortality study. Cedar City,
Utah. June 1979 - September 1979.

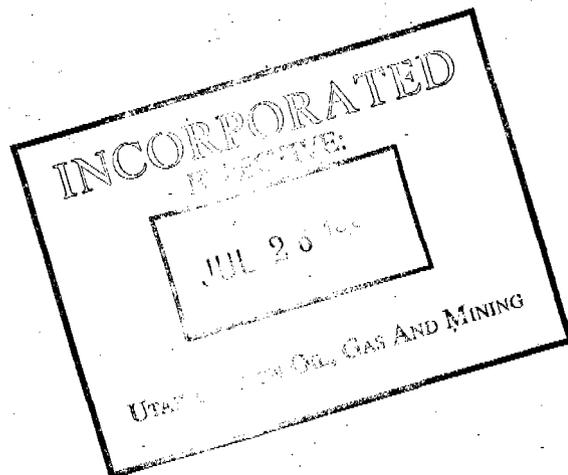
Biological Aide (11-3) For UDWR. Antelope fawn mortality study. Milford,
Utah. June 1978 - September 1978.

Biological Aide (11-2) For UDWR. Big game range inventory crew. Northern Utah.
June 1977 - September 1977.

Biological Aide (11-1) For UDWR. Hardware Ranch. Hyrum, Utah. June 1976-
September 1976.

PROFESSIONAL ORGANIZATIONS

Member - Utah Chapter of The Wildlife Society





United States Department of the Interior

FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO-UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

~~FILE~~
OCT 16 1981

IN REPLY REFER TO: (ES)

October 9, 1981

Cleon B. Feight, Director
Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

OCT 15 1981

DIVISION OF
OIL, GAS & MINING

Dear Mr. Feight:

This letter is written in response to your request that the Fish and Wildlife Service (FWS) assist in determining hazardous distribution lines on coal mine lands of Utah. This request was made because large numbers of eagles and other raptors have been electrocuted on distribution lines throughout Utah. Moreover, various state and federal regulations require mining companies to design powerlines safe for raptor use.

During the week of August 24-28, 1981, Ron Joseph of my staff met with representatives from eight of nine mining companies near Price, Utah, to conduct a field examination of distribution lines traversing coal tract areas. A comprehensive examination of all mine site powerlines will be completed by February 1982 and you will be notified by letter after FWS completes its examination. Consequently, this letter pertains only to the nine companies addressed below.

In general, hazardous powerline configurations were observed in valleys rather than in canyons where most mining activity is located. Many of the lines maintained by coal companies do not meet raptor electrocution preventive standards. However, they do not pose a threat to eagles and other raptors because, with few exceptions, the lines are not being used by raptors. While inspecting powerlines with company personnel, segments of potentially hazardous distribution lines were walked to determine the extent of raptor use. No sign of raptor excrement or prey remains were noted on the crossarm or at the base of the pole of any coal company powerlines.

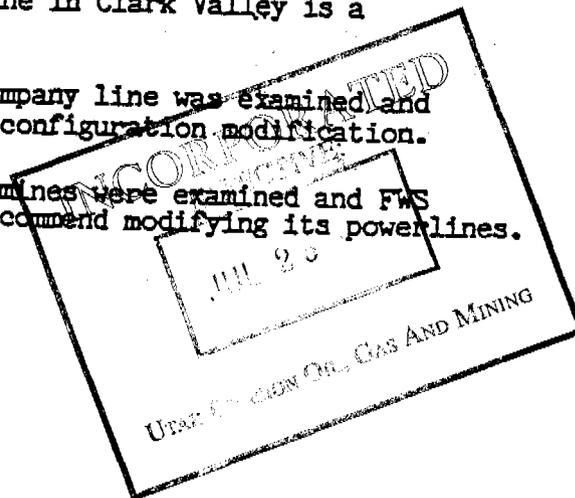
Several factors account for the relative low incidence of raptor use of mine site powerlines. Distribution lines in canyons with mining activity receive little raptor use because birds prefer to perch on the dominant, most prevalent perch site. These consist mainly of rocky outcroppings and trees near the rim of a canyon. The majority of raptors in canyon habitat use thermals and updrafts which provide them with an energy efficient means of "riding" air currents over ridges and high meadows during foraging activities. In addition, most powerlines parallel mining roads which are generally located at the bottom of the canyon.

Hence, they are not the most elevated perch site and their close association with vehicle disturbance and mining activities renders them of little value to raptors. Furthermore, live and dead coniferous trees are usually quite numerous in the canyons near Price and raptors prefer to perch on natural structures rather than powerpole crossarms. Some of the higher elevation mine electrical lines are located between 8,000 and 8,500 feet. These do not pose a serious threat to raptors during the winter because heavy snowfall at these elevations reduces raptor activity as prey becomes scarce.

Utah Power and Light (UP&L) rather than coal companies are responsible for the safety maintenance of line configurations on Bureau of Land Management (BLM) administered lands near Price. My raptor biologist suspects that the majority of lines which are electrocuting eagles in Central Utah are located in the relatively flat sagebrush valleys. These lines are operated and maintained by UP&L and are not within the permit boundaries of the mines examined. For example, Kaiser Steel obtains its energy from a UP&L line in Clark Valley. The 46 kV line in this valley poses an electrocution threat to raptors because the habitat is considerably different from the canyon topography and raptors are more inclined to use the line as a perch. This is due to a lack of natural elevated perch sites. Raptor electrocutions are compounded along this line as migrant eagle populations increase during the winter months. FWS will examine the powerline this winter and if eagle carcasses are collected we will meet with UP&L to insure that the configuration is modified. We do not expect a problem with Kaiser Steel but we will also inspect their lines since it is in close proximity to the Clark Valley line.

All existing lines were examined for the following companies:

1. Beaver Creek Coal Company lines for Gordon Creek Number 2, 3 and Huntington Canyon Number 4. FWS does not recommend altering the design of any lines.
2. Kaiser Steel obtains its energy from a UP&L line in Clark Valley. FWS does not recommend modifying the Kaiser line; however, it will be examined this winter since a 46 kV line in Clark Valley is a threat to eagles.
3. Soldier Creek Mining Company line was examined and FWS does not recommend configuration modification.
4. The U.S. Steel Company mines were examined and FWS found no evidence to recommend modifying its powerlines.



5. The Plateau Mining Company lines were examined for the Star Point mine. Its lines do not pose a threat to raptors. However, a 13.2 kV line maintained by UP&L supplying power to the Star Point Mine will be examined this winter since it crosses sagebrush habitat.
6. Blazon Company Number 1 mine also appears safe for raptors. The mine is located above 8,000 feet and would receive little raptor use.
7. Valley Camp mine is above 8,000 feet and we suspect that it also poses no problem since very few raptors winter at this elevation.
8. U.S. Fuel lines at Hiawatha were examined on foot and by automobile. Due to their locations at the bottom of the canyon and close proximity to roads and mine sites, they are rarely used by raptors. FWS does not recommend any modification of their lines.
9. All existing lines of Price River Coal Company mines were examined. These include the lines at mine Numbers 3, 5, and 6. We do not recommend modifying any of these lines.

In closing, FWS does not expect a raptor electrocution problem on any of the forementioned coal company lines. Consequently, we do not recommend modifying any lines at this time. However, FWS will spot check these lines in February to determine the extent of use by wintering raptors. Specific poles could be modified if an isolated case of an eagle electrocution occurs on any company lines. Increased measures could be taken to correct any unexpected "hot spots" should they develop.

Powerline maps for each company are located at our Salt Lake City office. Ron Joseph would be available to meet with members of your staff if you would like line locations transmitted to your maps.

Sincerely yours,


Acting Area Manager

UTAH DIVISION OF GREAT SALT LAKE MINING

APPENDIX 10-E

MITIGATION

AND

IMPACT AVOIDANCE

APPENDIX 10-E

10.1-2

MITIGATION AND IMPACT AVOIDANCE PROCEDURES

SMC 780.16 or UMC 784.21; FISH AND WILDLIFE PLAN
CASTLE GATE COAL COMPANY

Mitigation and Impact Avoidance Procedures General to All Wildlife

Utah Division of Wildlife Resources provides the following recommendations in order to minimize disturbances and impacts on wildlife and their habitats that could be impacted during developmental, operational and reclamation operations at the Company's mining project. The recommendations address how enhancement of the wildlife resource and their habitats, as discussed in UMC 783.20, can be achieved. They are also consistent with the performance standards of UMC 817.97. In instances where it would be necessary to restore or could be beneficial to enhance or develop high value habitats for fish and wildlife, recommended plant materials and rates of application are provided as "Appendix B" (UMC 817.97 and UMC 817.111 through 817.117). This list should prove useful in meeting the additional requirements to be imposed upon the operator if the primary or secondary land use will be for wildlife habitats (UMC 817.97 d 9). Additionally, "Appendix C" represents a list of commercial sources for plant materials.

The project and adjacent areas are represented by nine basic wildlife habitats which are inhabited on occasion and during different seasons of the year by about 200 species of vertebrate wildlife. The wildlife habitats and use areas for the "high interest" species from this group of wildlife have been ranked into four levels of importance.

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The most valuable to an individual species or ecological assemblage are the critical sites followed in respective importance by high-priority, substantial value and limited value sites. Each type of use area requires various and specific levels of protection from man's activities. Additionally, due to the variability of vegetation communities in each use area, various and specific technologies in site development will need to be evaluated for possible mitigations, enhancements of wildland habitats or the required level of reclamation. It is recommended that all land clearing impacts be designed so that irregular shaped openings are created in contrast to openings that would have straight edges.

It is recommended that the Company make significant efforts to educate all employees associated with their coal handling operation of the intricate values of the wildlife resource associated with the project and adjacent areas and the local area. Each employee should be advised not to unnecessarily or without proper permits harass or take any wildlife. (Apprehension of wildlife violators has increased by nearly 250 percent during recent years in the region). It is especially important that wildlife not be harassed during winter periods, breeding seasons and early in the rearing process. Exploration should be limited as much as possible during these crucial periods.

During winter wildlife are always in a depleted condition. Unnecessary disturbance by man causes them to use up critical and limited energy reserves which, often times, results in mortality. In less severe cases, the fetus being carried by mammals may be aborted or

absorbed by the animal, thus reducing reproductive success of a population.

During breeding seasons, disturbance by man can negatively affect the number of breeding territories for some species of wildlife. Disturbance can also interrupt courtship displays and preclude timely interactions between breeding animals. This could result in reduced reproductive success and ultimate reductions in population levels.

Early in the rearing process, young animals need the peace and tranquility normally afforded by remote wildlands. It is also during this crucial period that young animals gain the strength and ability to elude man and other predators. This allows the young animal to develop in relatively unstressed situations and to utilize habitats that are secure from predators. Disturbance by man can compromise this situation and result in abandonment of the young by the female, increased accidents that result in mortality to young animals or increased natural predation. It is recommended that employees be cautioned against disturbing young animals or females with young if accidentally located.

Employees associated with coal handling operations should be instructed that when wildlife are encountered during routine work that they not stop vehicles for viewing purposes. Moving traffic is less disturbing to wildlife than traffic that stops or results in out-of-the-vehicle activities. If viewing is desirable, the vehicle should only be slowed, but not stopped.

Hunting and other state and federal wildlife regulations must be adhered to by sportsmen utilizing the project area.

Mitigation and Impact Avoidance Procedures for Aquatic Wildlife

There are no recommendations for a wildlife plan that would enhance the fisheries associated with the Company's proposed operation.

If ultimate operations are planned or occur that could physically or chemically impact any perennial stream beyond the impact of mere crossings, detailed reclamation plans will be required. Permanent culvert crossings exceeding a width of eight feet must have a natural bottom and devices for reducing stream velocity so that fish migration is not blocked. A reclamation plan for a stream or lake would have to provide for measurement of the physical characters of the water prior to disturbance. Such measurements should consider surface water information required in SMC 779.16, data on stream velocity, gradient, width, depth, pool-riffle ratio and substrata types.

Reclamation that would achieve development of a lake bed or stream channel similar in character to that which existed prior to disturbance should result in natural re-establishment of macroinvertebrates, macrophytes and a fish population. If merited, the Division could then introduce desired fishes into those waters. This would adequately mitigate for disturbance and temporary loss of aquatic resources. There would be no mitigation for displacement and possible loss of other wildlife species dependent upon the aquatic wildlife as a prey source. It is believed that impacts on such species would not be significant.

It is also recommended that adequate precautions be taken to keep all forms of coal or other sediments from being inadvertently deposited along or within perennial stream channels. Similar precautions should

be taken to preclude deposition of coal particles or sediments in or along other drainages from which the material could be transported during a precipitation event into a perennial stream. This would include blow-coal from haulage trucks, railroads or other transportation systems and storage piles. Control of larger coal particles from the above sources is equally important to control of fugitive dust. If needed, haulage vessels or storage sites should be covered, or the surface of the coal appropriately sprayed in order to solidify it against wind movement. Travel speeds of haulage vessels could be reduced so that coal is not allowed to leave the transportation system. The impacts of coal or other sediments on aquatic ecosystems are many and varied; therefore, sediments must be kept out of those systems.

Utah Division of Wildlife Resources reaffirms all of the recommendations in UMC 817.41 through 817.57 and UMC 817.126 for protecting the State's waters and their associated riparian and wetland zones along with the aquatic wildlife resource.

Mitigation and Impact Avoidance Procedures for Terrestrial Habitats

It is recommended that all wetland and riparian habitats be maintained. Roads and other facility developments should not destroy or degrade these limited, highly productive and unique habits. Roads crossing through those areas should do so in a manner that is least damaging to the habitat. Wetlands and riparian habitats are ranked as being of critical value and are the most productive sites in terms of herbage and biota produced as compared to other local habitat types. It is probable that a majority of the vertebrate wildlife that inhabit the project area make some use of riparian or wetland areas.

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It is important to note that roads and other surface facilities to be constructed should as far as practicable be placed at sites where they will not compromise wildlife or their use areas. Also, surface facilities, including roads, should be screened if possible from wildlife use areas by vegetation or terrain.

In situations where wildland habitats have been or will be disturbed, reclamation is required. Also, there are sites where development or enhancement of wildlife habitats through vegetation treatments and/or seedings and transplants of seedlings could benefit wildlife. "Appendix B" depicts the Division's recommendation for plant materials to be utilized for various wildlife habitats on wildland treatments that are intended to benefit wildlife. If circumstances arise where seed or seedling transplants for a recommended plant species are not available, suitable alternates are also recommended.

Seedling transplants from nursery stock, as well as nearby rangelands, would also be acceptable for some wildland treatments.

Appendix C represents an exhaustive list of commercial sources for plant materials for use in wildland treatments.

Temporary control of rodents may be required to ensure a successful rangeland treatment. It is recommended that the county agent be consulted in this area of concern. Poisoned oats are the most common and acceptable method for rodent control; however, only licensed persons may apply the treatment.

Currently, there are some new concepts in methodology for revegetation that are being successfully implemented in other parts of

the nation and world. One promising method is a procedure where a large scoop removes, from a natural and stabilized site, a small area of earth intact with vegetation and subsurface soils for placement on a site to be restored. This same procedure can be utilized when disturbing pristine sites, except that the native vegetation is stored for use in latent reclamation. Another meritorius method for stimulating natural revegetation, in combination with other reclamation techniques, is to plan facility developments so that islands of natural, native vegetation remain. This will allow for natural vegetation to spread from the islands. These techniques can also be useful for enhancement of poor quality sites that currently exist on the mine plan area.

Encapsulation of seed and fertilizer for several releases over a period of years after a single application is a new and possibly advantageous procedure. This technique, along with soil stabilizing structures, has been successfully used in South Africa. Dr. J. Van Wyk in the Department of Botany at Potchetsroom University in South Africa could provide additional information on this new technique.

There are also new specialized techniques coming to the forefront for stabilization of problem sites such as roadbanks and steep slopes. It is important that these sites be promptly and permanently revegetated in order to reduce siltation into local riverine systems. This will mitigate for damage to aquatic sites or reclamation of disturbed sites can mitigate for salt loading of local river systems. It is believed that natural, nonpoint sources represent 50 percent of the salinity in the upper basin of the Colorado River system into which this mine plan area drains.

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It is recommended the Company make numerous contacts with appropriate agencies, institutions and persons to ensure that enhancement or reclamation projects achieve the required degree of permanency, plant diversity, extent of cover and capability of regeneration to ensure plant succession. Generally speaking, seeding should be accomplished as late in the fall as possible. Seedling transplants need to be coordinated with local soil moisture conditions which are usually at optimum in the early spring just as the snow melts.

It is paramount that suitable vegetation be maintained and/or reestablished if the life requirements of wildlife are to be satisfied in the postmining period. Success in this area of concern along with cessation of man's disturbances will likely result in a natural reinvasion and the resultant inhabitation by most wildlife species of an impacted site.

It is important to note that enhancement or reclamation projects that are to benefit wildlife must be properly designed so that all the life requirements of the target species are considered in conjunction with forage. Water must be provided or be present and thermal cover along with escape and hiding cover has to be in abundance. Loading areas and travelways between the many types of use areas must also be provided. In order to meet these goals, a considerable degree of consultation will be required between the Company and Utah Division of Wildlife Resources.

As a service and also to ensure that the needs of wildlife are met, the various expertise within the Division of Wildlife Resources are

available to the Company for consultation. For the most part, Larry Dalton, Resource Analyst, for the Southeastern Regional office at 455 West Railroad Avenue in Price, Utah 84501 (phone 637-3310) will coordinate any needed contacts. Richard Stevens, Wildlife Biologist, at the Great Basin Research Center, Box 704, in Ephraim, Utah 84627 (phone 283-4441) is available for consultation and site specific analysis concerning species for vegetation plantings, timing and techniques to achieve the best results.

In instances where revegetation projects are to be planned over coal waste areas, heavy metal uptake by the plants must be evaluated. It is recommended that the Company initiate an appropriate long-term monitoring program to determine the magnitude and resolutions, if needed, for this problem.

It is recommended that persistent pesticides not be utilized on the project area. Other alternate pesticides or forms of control should be utilized.

All hazards associated with the project operation should be fenced or covered to preclude use by wildlife; of special concern would be sites having potential to entrap animals or toxic materials.

Mitigation and Impact Avoidance Procedure for Amphibians and Reptiles

Enhancement or development of habitats that provides a diversity of vegetation will benefit amphibians and reptiles. It is important to note that all of these species are protected by Utah law. Due to the myriad and myths that surround these animals, it is urged that individual specimens not be destroyed. This is especially true for snakes since they are a valuable component of the ecosystems.

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Snake dens are ranked as being of critical value to the population and are protected by law. If a den is located, it should be reported to the Utah Division of Wildlife Resources. Snake dens can be moved, but only with intensive efforts that may take a year or more (snakes are caught and removed in the spring and fall). Thus, construction of facility developments may take place in denning locations if there is sufficient lead time to relocate the occupants.

Mitigation and Impact Avoidance Procedures for Avifauna

It is recognizable that development and operation of a mining project will, in some cases, negatively impact many avian species through physical destruction of habitats and continual disturbance that makes other habitats unavailable or less desirable to an individual bird. It is also true that impacts that are negative to one species may be beneficial to another species. It is recommended that the Company plant native and/or ornamental berry producing shrubs around surface facilities. When mourning doves are a target species, sunflowers or blazing star should be planted. This will provide food and cover for many of the smaller species of birds, resulting in enhancement of their substantial value and high-priority habitats. This action would also mitigate for disturbances and destruction of avifauna habitats at other sites associated with project operations.

It is important to note that the nests of all avifauna (except the house sparrow, starling and ferral pigeon) when active and their eggs are protected by federal (Federal Migratory Bird Treaty Act) or state laws (Utah Code 23-17-1 and 23-17-2). All avifauna utilize a nest

during their reproductive process. Dependent upon the species, some nests are well developed while others may be represented by only a scrape on the ground. These sites, when being utilized, are critical to maintenance of individual bird populations; each species has a specific crucial time period in which the nest is occupied. It is during this crucial period that the nest must be protected from disturbance.

Riparian and wetland areas need to have complete protection from disturbance between mid-March and mid-June due to the crucial nesting season of waterfowl. Disturbance should be significantly limited from mid-June through mid-October in order to protect the high-priority habitat values for brooding, molting and migrating waterfowl.

The integrity of agricultural lands, if any, associated with the project needs to be maintained due to their critical value to waterfowl, pheasants and wildlife associated with or dependent upon the pasture and fields wildlife habitat.

Several species of raptors frequent the project area. Their nests, when active, should not be disturbed, and abandoned stick nests are never to be damaged. Every effort should be made to eliminate man's disturbance within visual sight or one-half kilometer radius of an active raptor nest. This distance would have to be increased to one kilometer radius if the cause for disturbance were to originate within view and from above the nest. This effort is demanded in the instance of golden eagles and cliff nesting falcons since they are sensitive to disturbance and could abandon the nest. Termination of man's use of a site would not be required if eagles or falcons constructed their nest

after mining had been initiated, since it would demonstrate the individual bird's willingness to tolerate mining activities and the associated disturbance by man.

Roost trees of eagles, if located, must not be disturbed or destroyed. Similarly, activities planned for high-priority concentration areas of eagles must be designed and implemented so that they are not of significant disturbance to the birds.

As a general comment, whenever active raptor nests are observed or roost trees for eagles located, they need to be reported to the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

Design and construction of all electrical power lines and other transmission facilities shall be designed in accordance with guidelines set forth in "Environmental Criteria for Electric Transmission System" published by the USDA and USDI in 1970 and/or the REA Bulletin 61-10 "Powerline Contacts by Eagles and Other Large Birds". It is also recommended that placement of utility poles over flat or rolling terrain be planned so that they are out of view of roads or at least 300 meters away from any roads. This will lessen opportunity for illegal killing of these valuable birds, since the poles can serve as suitable hunting perches for raptors. In some instances, poles can result in an extension of raptor hunting territories, which would represent a beneficial impact.

During the crucial period of December through February, spruce-fir forests and aspen forests need to be protected from man's disturbance so that blue grouse and ruffed grouse will not be impacted. Destruction of

these wildlife habitats at any time of the year need be minimized due to their value to wildlife.

During the spring period (mid-March through mid-June) care needs to be taken that male blue grouse are not disturbed or precluded from establishing breeding territories. Similar precautions need be taken for male ruffed grouse (March through May) in the area of drumming logs.

Agricultural lands, if any, associated with the project should be maintained under traditional agricultural practices and not converted to other uses. These lands are of critical and high-priority value to avifauna and a myriad of other wildlife dependent upon agricultural systems.

Mature trees with natural cavities and dead snags need to be protected for use by cavity nesting birds. Trees with such a character are ranked as being of critical value to cavity nesting birds. The project should be planned so that three such trees are left standing per acre within 500 feet of forest openings or water and two such trees per acre in dense forested areas.

Mitigation and Impact Avoidance Procedures for Mammals

The lodges, nests and dens of all mammals or roosts in the instance of bat-like mammals represent a critical use area for maintenance of their individual populations. The crucial period for any species is when the lodge, den, nest or roost is occupied. Therefore, such sites for any mammal must be protected from disturbance during that period when it is being utilized.

Many species of mammals develop food caches in order to carry

individual animals or family groups through periods when they cannot forage. Such sites are of critical value to maintenance of their populations and if located should not be destroyed or subjected to regular disturbance by man.

It is important to realize that within natural ecosystems there exists a predator-prey relationship. One species of animals may represent a prey source for other species. Therefore, it is important that project operations be designed and implemented so as to not unnecessarily disturb or destroy any wildlife or their habitats.

Big game ungulates—mule deer, moose, elk, pronghorn antelope, bighorn sheep and bison—each have seasonal use areas ranked as being of critical value to an individual herd. Such sites need to be protected from any of man's activities or developments that could result in destruction, loss or permanent occupancy of the site by man or his facility developments. If these types of impacts cannot be avoided, the site must ultimately be reclaimed and revegetated. Also, critical valued areas need protection from disturbance during their appropriate crucial period.

High-priority valued use areas for all wildlife and particularly big game ungulates need to be protected from man's activities or facility developments. Actions that would result in loss or permanent occupancy of significant acreages (25 or more acres) of habitat are of special concern. In any event, impacts to high-priority valued areas should be limited and ultimate reclamation planned. Many impacts can be avoided simply by precluding exploration, developmental or other

activities during the period of time when a high interest specie is present.

Haulage of coal between the various mine projects and distribution points should be planned so that impacts to wildlife are lessened; of special concern is haulage of coal through wintering areas for big game. It is recommended that the Company develop coal haulage contracts that require personnel involved with coal haulage to use extreme caution so that accidental collisions between motor vehicles and big game are reduced. Without doubt, a reduction in speed across winter ranges would alleviate this problem during the period between November 1 and May 15 each year.

At present, the most successful and cost effective technique for reducing deer-highway mortality is a system of warning reflectors. This system (manufactured by Strieter Corporation, 2100 Eighteenth Avenue, Rock Island, Illinois 61201 and known as ("Swareflex") is only of value at night time, but it is during darkness that most deer-highway mortality occurs. Strieter Corporation describes the effect of the reflector system as follows: "The headlights on approaching vehicles strike the wildlife reflectors which are installed on both sides of the road. Unnoticeable to the driver, these reflect red lights into the adjoining terrain and an optical warning fence is produced. Any approaching wildlife is {are} alerted and stops or returns to the safety of the countryside. Immediately after the vehicle has passed, the reflectors become inactive, thereby permitting the animals to cross safely".

Installation of a wildlife warning reflector system, a reduction in speed of coal-haulage trucks and other mine-related traffic and increased awareness of wildlife values by mine associated employees should result in a reduction of deer-highway mortality problems. Such a reduction would represent satisfactory mitigation for the now existing problem.

In instances where conveyors, slurry lines or any other structure having potential to be a barrier to big game movement is to be developed, passage structures must be provided. Generally speaking, overpass and underpass type structures are recommended in order to allow passage of big game to habitats either side of any barrier. These crossings should be placed at the points to be identified from intensive study of big game movements in relation to the mine plan area. Such study would not be required if the structure was adequately elevated to allow uninhabited passage of big game along its entire length.

Underpasses should have a minimum clearance of three meters maintained across a span of at least five meters. Overpasses should be designed as a circular earthen ramp with the barrier bisecting the ramp into two equal halves as follows:

On either side of the conveyor a half-round ramp with a slope no greater than 3:1 on a five meters wide path placed at an angle 90 degrees to the conveyor and tapering around to a slope of 5:1 at paths adjacent and parallel to the conveyor. The platform over the conveyor should be concrete or some other material that would not echo when being crossed by big game and should be of character similar to rock or natural earth.

Soils associated with either crossing style should be of the A or B horizons to allow for development of vegetation. Vegetative cover must be established in association with all crossing sites. This will lessen anxiety of individual animals using the site through development of a natural-appearing environment.

Mature pinion or juniper trees and an abundance of browse plants need to be placed proximal to crossing points in order to provide a safe travelway. The browse plants will also serve as a permanent attraction for big game to crossing points. Additionally, a mixture of grass and forb seeds should be broadcast over each crossing point to stabilize the soil and enhance the forage situation.

Appropriately sized boulders may need to be placed at crossing sites in order to control off-road vehicles utilized in outdoor recreation.

Industrial developments are encouraged on habitat use areas that are ranked as being of limited value to wildlife. It should be noted, however, that reclamation is ultimately expected on any wildlife use area, regardless of its value to wildlife.