

BANNING LOADOUT UTAH

PERMIT APPLICATION PACKAGE

December 1987

Volume 2



SOLDIER CREEK COAL CO.

Telephone (801) 637-6360

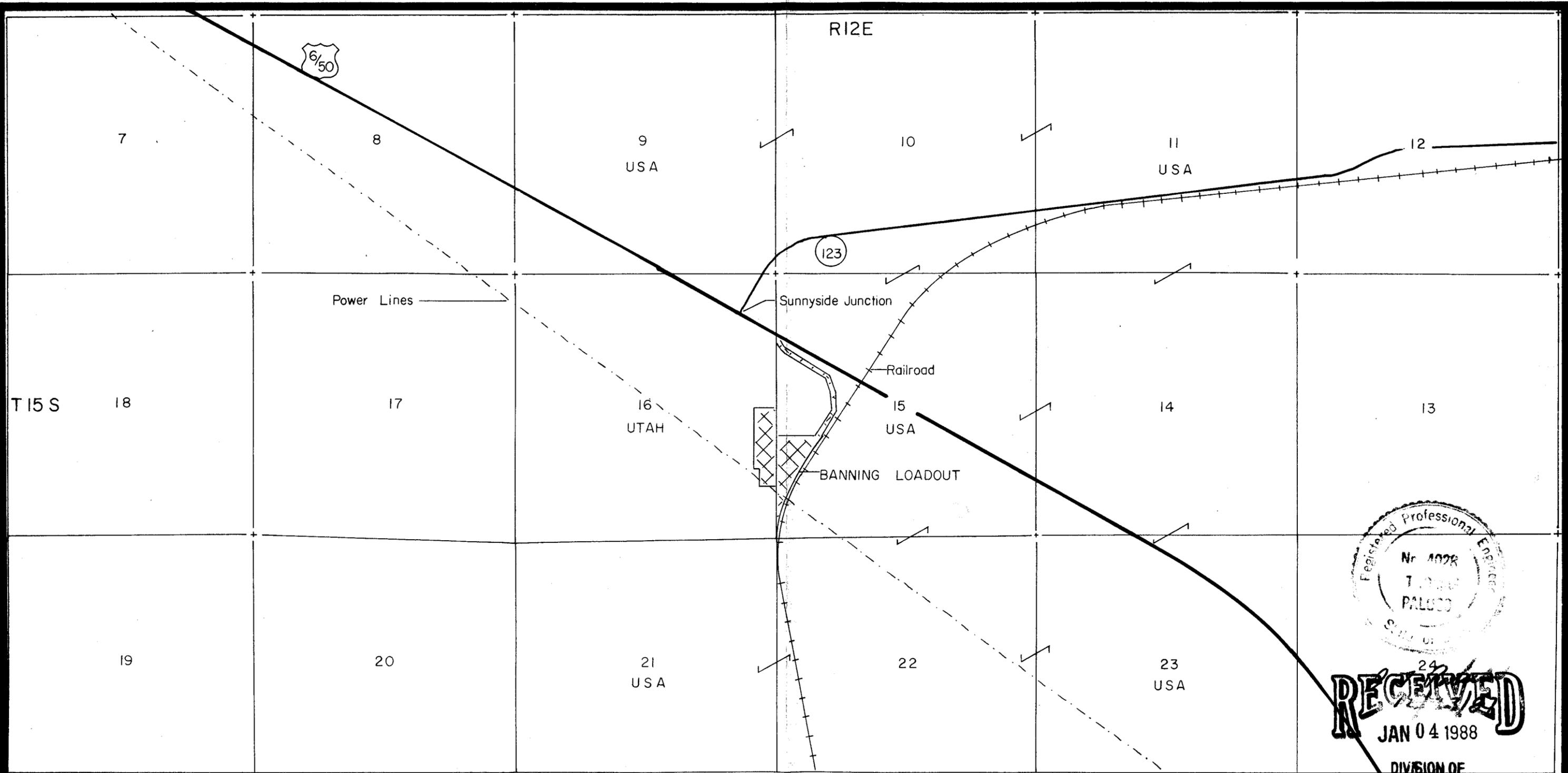
P.O. Box 1
Price, Utah 84501 *

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JAN 04 1988

DIVISION OF
OIL, GAS & MINING

PART 10.0
EXHIBITS

<u>EXHIBIT</u> <u>NUMBER</u>	<u>DRAWING</u> <u>NUMBER</u>	<u>TITLE</u>
1.1-1	D 220	Proposed Improvements at Banning Loadout
1.5-1	B 135	Surface Ownership
1.5-2	B 137	Subsurface Ownership
2.1-1	D 219	Permit Area Map
2.1-2	D 215	Surface Facilities - Banning Loadout
3.3-1	D 218	Final Contour Map
4.2-1	D 222	Cross Sections
5.2-1	D 224	Runoff Control Measures
5.2-2	D 225	Sed. Pond Plan and Sections
5.2-3	D 226	Sedimentation Pond Details
6.2-1	D 227	Location of Soil Resources



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REVISIONS		
NO.	DATE	BY
1		
2		
3		



Soldier Creek Coal Company

SOLDIER CANYON MINE

SCALE:
1" = 2000'

DRAWN BY
CPA

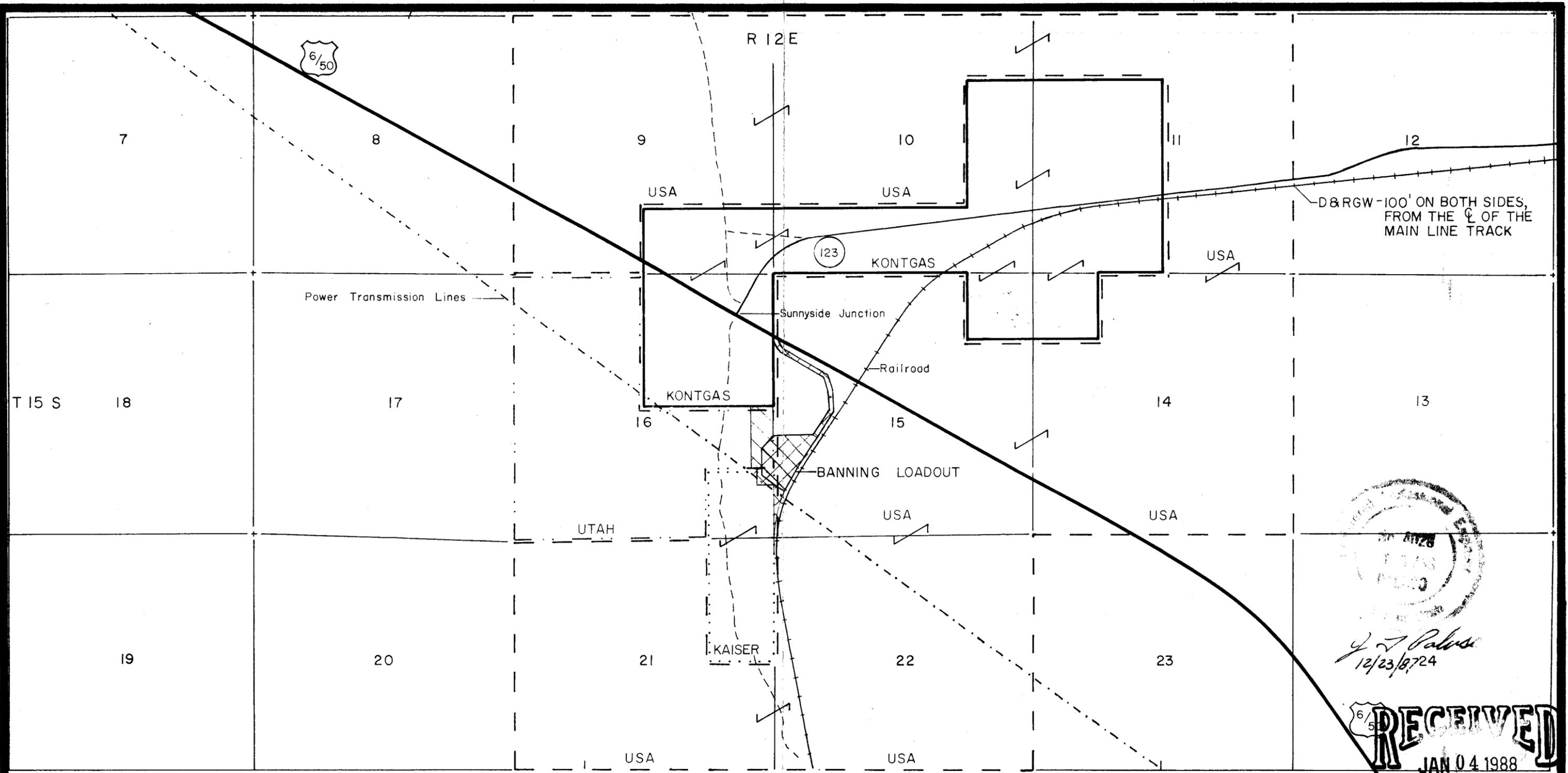
TITLE:
SUBSURFACE OWNERSHIP

CHECKED _____ DATE _____

APPROVED _____ DATE _____

DRAWING NO.
B 137

EXHIBIT I.5-2



J. J. Palmer
12/23/87

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REVISIONS		
NO.	DATE	BY
1		
2		
3		



DIVISION OF
OIL, GAS & MINING

Soldier Creek Coal Company

SOLDIER CANYON MINE

SCALE:
1" = 2000'

DRAWN BY
CPA

DATE
8/17/87

TITLE:
SURFACE OWNERSHIP

CHECKED

DATE

APPROVED

DATE

DRAWING NO.
B - 135
EXHIBIT I.5-1

APPENDIX I
Containment Dike Calculations

DESIGN OF RUNOFF CONTAINMENT DIKE,
SOUTHEAST CORNER OF BANNING LOADOUT

Purpose

To contain water that currently flows from the site and that cannot be gravity-fed to the sedimentation pond.

Stage - Capacity Data

For the area between the berm (diverting site runoff to the pond) and the dike adjacent to the fence (retaining localized runoff on site):

<u>Elev.</u> (ft)	<u>Area</u> (ft ²)	<u>Volume</u> <u>Incremental</u>	<u>Volume</u> <u>Cumulative</u> (ft ³)
5494.5	0	0	0
5495.0	550	137.5	137.5
5496.0	2925	1737.5	1875.0
5497.0	6125	4525.0	6400.0

} See pg. 2
of this
calc.

Design Runoff

10-yr, 24-hr precipitation = 1.78 in (NOAA Atlas 2 - Vol. VI)

CN = 90 (disturbed)

Q = 0.91 in

= 460 ft³ (over 6125 ft² area)

Dike Design

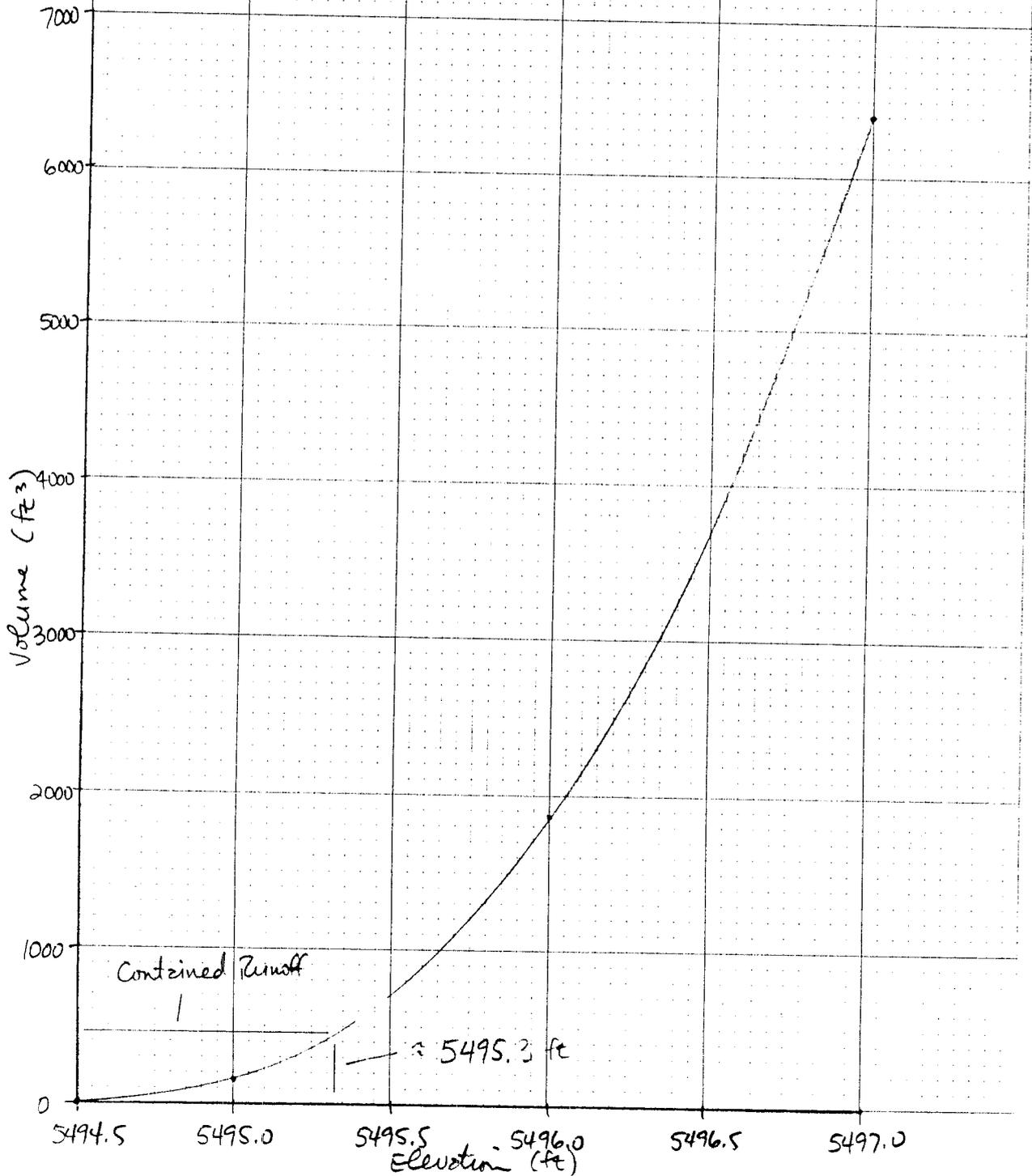
Ponded water elevation = 5495.3 ft (pg. 2)

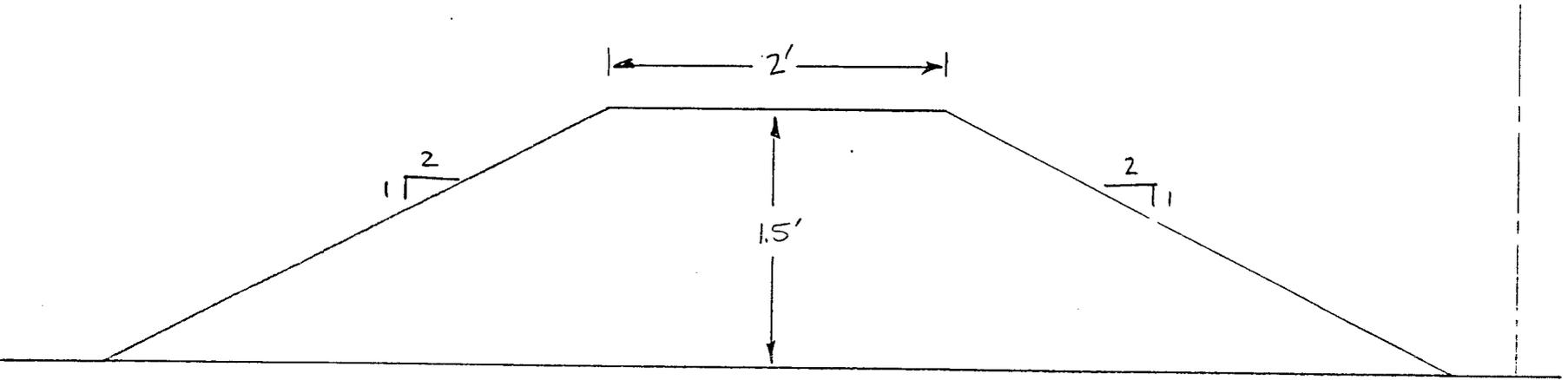
Low ground elevation = 5494.5 ft (site map)

Water depth at low pt. = 0.8 ft + freeboard

Construct dike 1.5 ft tall. See design on pg. 3 of this calc.

Stage - capacity curve for area between
berm and corner dike - SE corner
of Banning Loadout





CONTAINMENT DIKE SECTION
SCALE: 1" = 1'

APPENDIX II

Sedimentation Pond Calculations

SEDIMENTATION POND DESIGN
FOR BANNING LOADOUT

Design Volume

Berms, roads, and ephemeral channels around the edges of the loadout area keep undisturbed-area runoff from entering the site. Within the disturbed area, the area within the loading dock ramp is totally contained by the roadway and, thus, acts as a closed basin (i.e., does not contribute runoff to the sedimentation pond). Hence, the area contributing to the pond is:

$$\begin{aligned} \text{Total area} &= 18.1 \text{ ac} \\ \text{closed basin} &= \underline{2.6 \text{ ac}} \quad (\text{no drainage to pond}) \end{aligned}$$

$$\text{Net drainage to pond} = 15.5 \text{ ac}$$

The presence of coal piles within the loadout area will act to reduce the runoff curve number below that normally expected for a disturbed site (due to retention within the piles, ponding adjacent to the piles, etc.). However, since the size of the piles will vary significantly through time, the effect of the piles will be conservatively ignored. Thus, for the entire disturbed area,

$$\text{CN} = 90 \quad (\text{Compare with typical CN} = 89 \text{ for dirt roads in hydrologic soil group D as recommended by the U.S. SCS, 1972}).$$

Required runoff storage volume:

$$Q = \frac{(P - 0.25)^2}{P + 0.85}$$

$$P_{10,24} = 1.78 \text{ in} \quad (\text{From Miller et al., 1973})$$

$$Q = \frac{[1.78 - (0.2)(1.11)]^2}{1.78 + (0.8)(1.11)} = 0.91 \text{ in}$$

$$Q = \frac{(0.91 \text{ in})(15.5 \text{ ac})}{12 \text{ in/ft}} = \underline{\underline{1.18 \text{ AF}}}$$

Required sediment storage volume:

Determine required volume from the modified Universal Soil Loss Equation (Clyde et al., 1978):

$$A = R \cdot K \cdot LS \cdot VM$$

R (rainfall factor) = 16 (see Clyde et al., 1978)

K (soil erodibility factor) = 0.37 (see Barfield et al., 1981 - typical value for silt loam soils. Compares favorably with regional map presented by Clyde et al., 1978).

$$LS = \left(\frac{650 + 450s + 65s^2}{10,000 + s^2} \right) \left(\frac{l}{72.6} \right)^m \quad (\text{Clyde et al., 1978})$$

where LS = length-slope factor
s = slope steepness (percent)
l = slope length (feet)
m = 0.5 (for slopes between 0.51% and 10%)

$$s = \left[\frac{(5340 \text{ ft})(5 \text{ ft})}{(15.5 \text{ ac})(43,560 \text{ ft}^2/\text{ac})} \right] (100)$$

$$= 4.0 \%$$

l = 250 ft (site observation)

$$LS = \left[\frac{650 + (450)(4.0) + (65)(16.0)}{10,000 + 16.0} \right] \left[\frac{250}{72.6} \right]^{0.5}$$

$$= 0.65$$

VM = 0.90 (From Clyde et al., 1978 for "rough, irregular, tracked all directions")

$$A = (16)(0.37)(0.65)(0.90) = 3.46 \text{ tons/ac/yr}$$

$$\text{Sediment Yield} = \frac{(3.46 \text{ tons/ac/yr})(2000 \text{ lb/ton})(15.5 \text{ ac})}{(90 \text{ lb/ft}^3)(43,560 \text{ ft}^3/\text{AF})}$$

↳ Assumed density

$$= 0.027 \text{ AF/yr}$$

Design the pond to store 10-yr of sediment. Ignore the sediment delivery ratio to be conservative.

$$\begin{aligned} \text{Required sediment storage} &= (0.027 \text{ AF/yr})(10 \text{ yr}) \\ &= \underline{\underline{0.27 \text{ AF}}} \end{aligned}$$

$$\begin{aligned} \text{Total required storage} &= 1.18 \text{ AF} + 0.27 \text{ AF} \\ &\quad \text{(water)} \quad \text{(sediment)} \\ &= \underline{\underline{1.45 \text{ AF}}} \end{aligned}$$

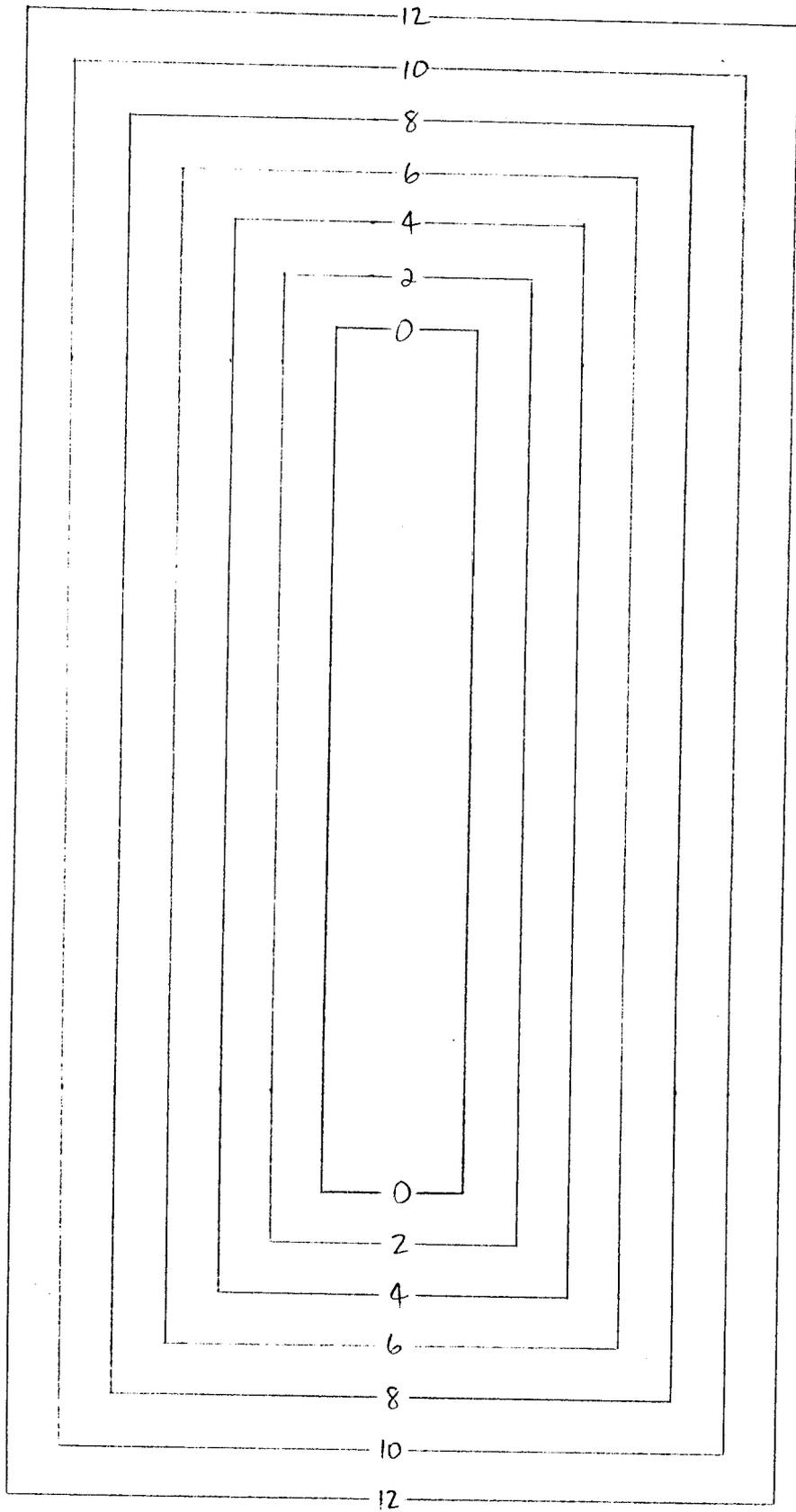
Stage - Area - Capacity Data

Use preliminary size provided on pg. 4 of this calc. Check volume for adequacy.

Stage (ft)	Area (ac)	Incremental Volume (AF)	Cumulative Volume (AF)
0	0.037	0.00	0.00
2	0.072	0.11	0.11
4	0.114	0.18	0.29
6	0.162	0.26	0.55
8	0.217	0.37	0.92
10	0.279	0.47	1.39
12	0.347	0.60	1.99

The stage - capacity curve, using the above data, is presented on pg. 5 of this calc. This curve suggests that the pond volume is sufficient to meet site requirements.

Interior of the proposed Banning loadout sedimentation pond:



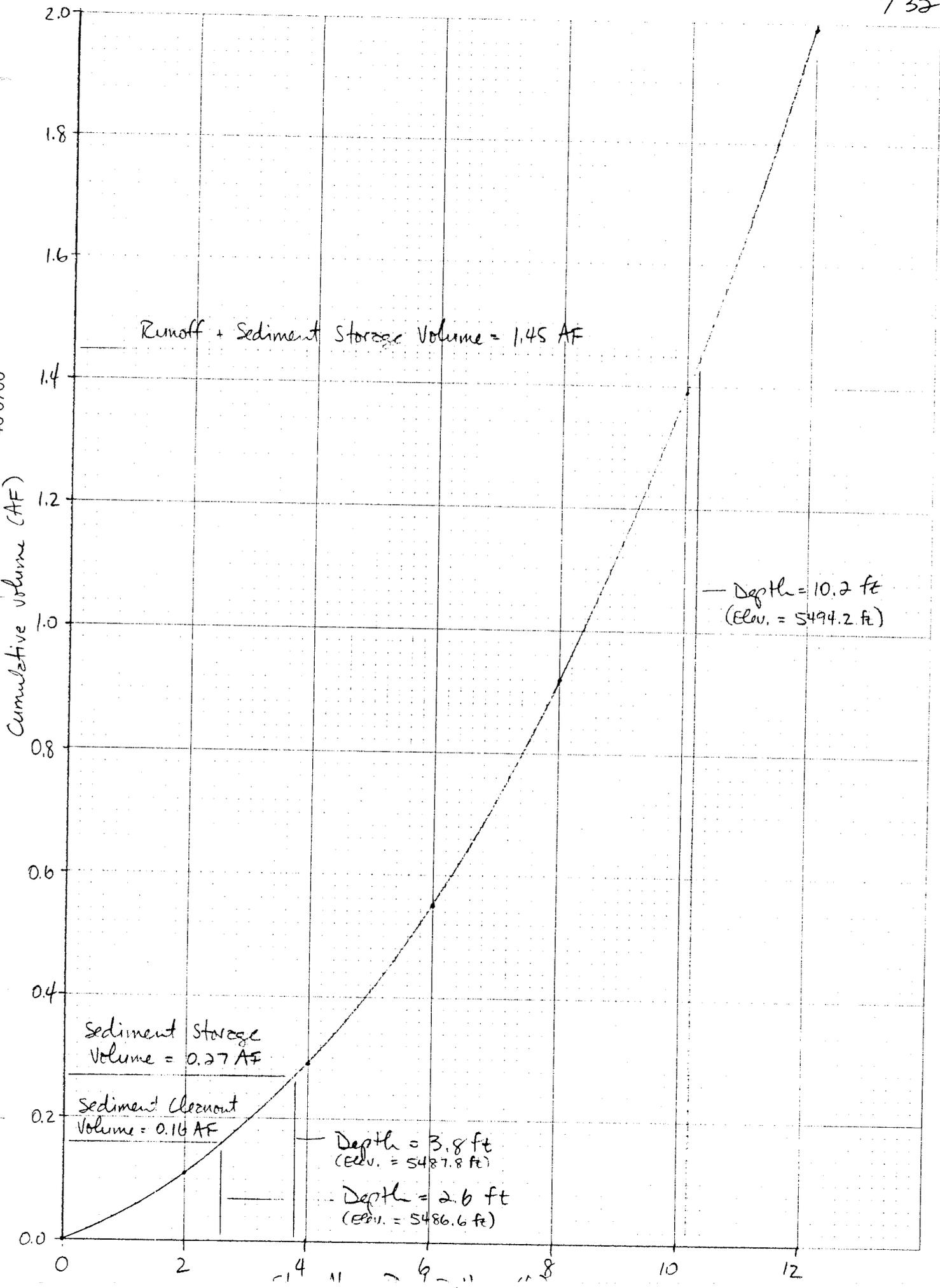
Elevations from pond bottom (ft.)
Elevation of pond bottom = 5484.0 ft

Scale: 1" = 20'

5/32

46 0700

12 X 10 TO THE INCH • 7 1/2 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



Spillway Sizing

Methodology → use SEDIMOT II (Wilson et al., 1980; Warner et al., 1980)

Design storm → 25-yr, 24-hr storm = 2.15 in (Miller et al., 1973)

Storm distribution → SCS Type II (preferred by the Division)

Time increment of outflow hydrograph = 0.1 hr

No. of junctions = 1

No. of branches = 1

Computation mode → hydro. and sed. (to allow routing through the pond. However, sed. yields will be suppressed since those are not of interest during the spillway-sizing design event).

Specific gravity of the eroded sediment = 2.50 (default)

Coefficient for distributing sediment load = 1.5 (default)

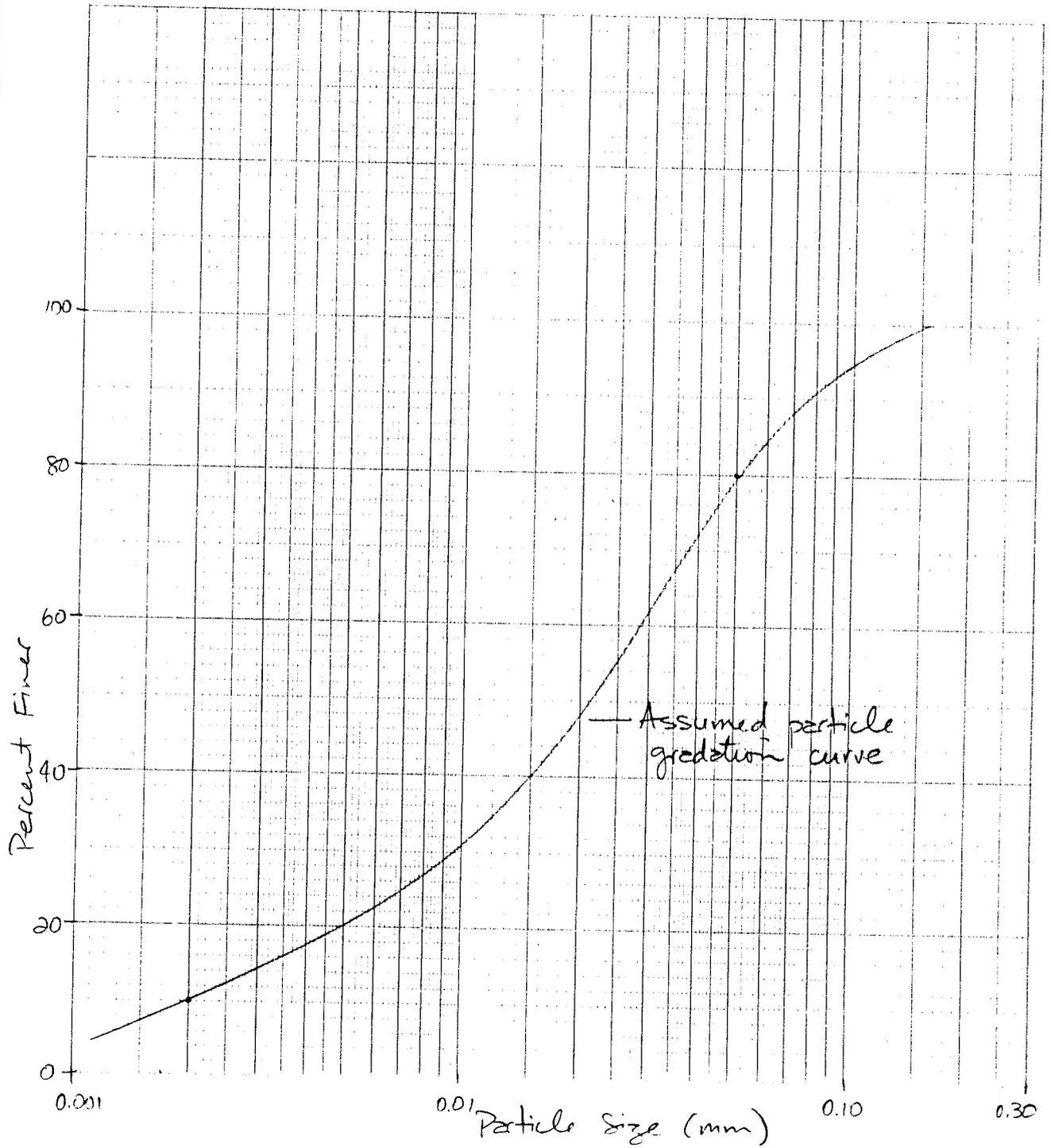
Submerged bulk specific gravity = 1.25 (fine to medium grained)

Particle size distribution → assume distribution typical of silt loam (general textural classification determined from local samples):

% sand (>0.05 mm) = 20	}	Typical values from Donahue et al. (1971)
% silt (0.002 - 0.05 mm) = 70		
% clay (<0.002 mm) = 10		

Assumed gradation curve provided on pg. 7 of this calc. It should be noted that these data are being input only to permit the model to operate properly. Particle size and percent-finer values to be input to the model:

Size (mm)	Percent Finer	
0.15	100	}
0.10	94	
0.05	80	
0.01	31	
0.005	20	
0.001	4	
0.0001	0	



No. of structures = 1 (sedimentation pond)

Between structures routing parameters → All \emptyset (no upstream structures or junctions)

No. of subwatersheds → 1

Data for subwatershed 1:

$$\text{Area} = 15.5 \text{ ac}$$

$$\text{CN} = 90$$

T_c → use upland method

Around the north and west side of the site:

1530 ft flow path at 0.6% slope

$$V = 1.5 \text{ ft/s} \quad (\text{from "paved area" curve on pg 9 of this calc.})$$

$$\begin{aligned} T_c &= 1020 \text{ s} \\ &= 17.0 \text{ min} \\ &= 0.28 \text{ hr} \end{aligned}$$

Around the south and east side of the site:

1150 ft flow path at 1.1% slope

$$V = 2.1 \text{ ft/s}$$

740 ft flow path at 0.5% slope

$$V = 1.4 \text{ ft/s}$$

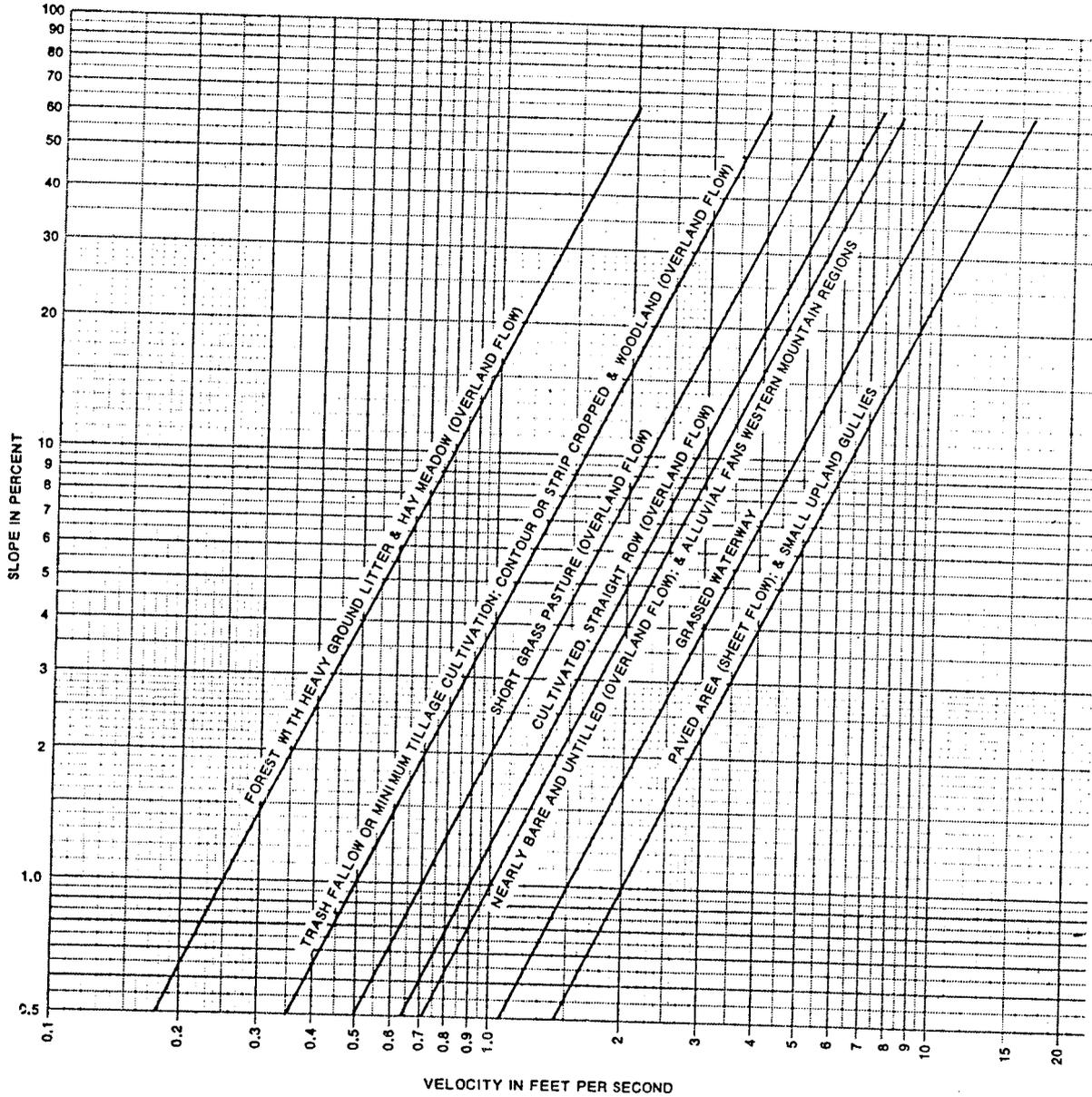
$$T_c = \frac{1150}{2.1} + \frac{740}{1.4}$$

$$= 1080 \text{ s}$$

$$= 18.0 \text{ min}$$

$$= 0.30 \text{ min} \Rightarrow \text{Use this value (largest of the two)}$$

Sediment yield values: $\left. \begin{array}{l} K = \\ L = \\ S = \\ CP = \end{array} \right\} \text{All } \emptyset \text{ (to suppress sed. output)}$



Source: U.S. SCS (1972)

Pond parameters:

Dead space \rightarrow Effective pond width (W_e) = $\frac{\text{Area}}{\text{Length}}$

For a depth of 10 ft (approx. storage elev.):

$$W_e = \frac{(0.2822)(43,560 \text{ ft}^2/22)}{160 \text{ ft}}$$

$$= 76.2 \text{ ft}$$

$$\frac{\text{Length}}{W_e} = \frac{160 \text{ ft}}{76.2 \text{ ft}} = 2.1 \left. \vphantom{\frac{\text{Length}}{W_e}} \right\} \text{Efficient system } (L/W_e > 2.0)$$

Assume minimal dead space of 20%

Outflow withdrawal \rightarrow surface

Inflow \rightarrow completely mixed

Stage-area data (for pond full to top of max. sed. straggler level):

Stage (ft)	Area (22)
0.0	0.110
1.0	0.132
2.0	0.157
3.0	0.183
4.0	0.211
5.0	0.240
6.0	0.271
6.4	0.285
6.7	0.295
7.0	0.305
7.5	0.321
8.0	0.339

Crest of principal spillway \rightarrow

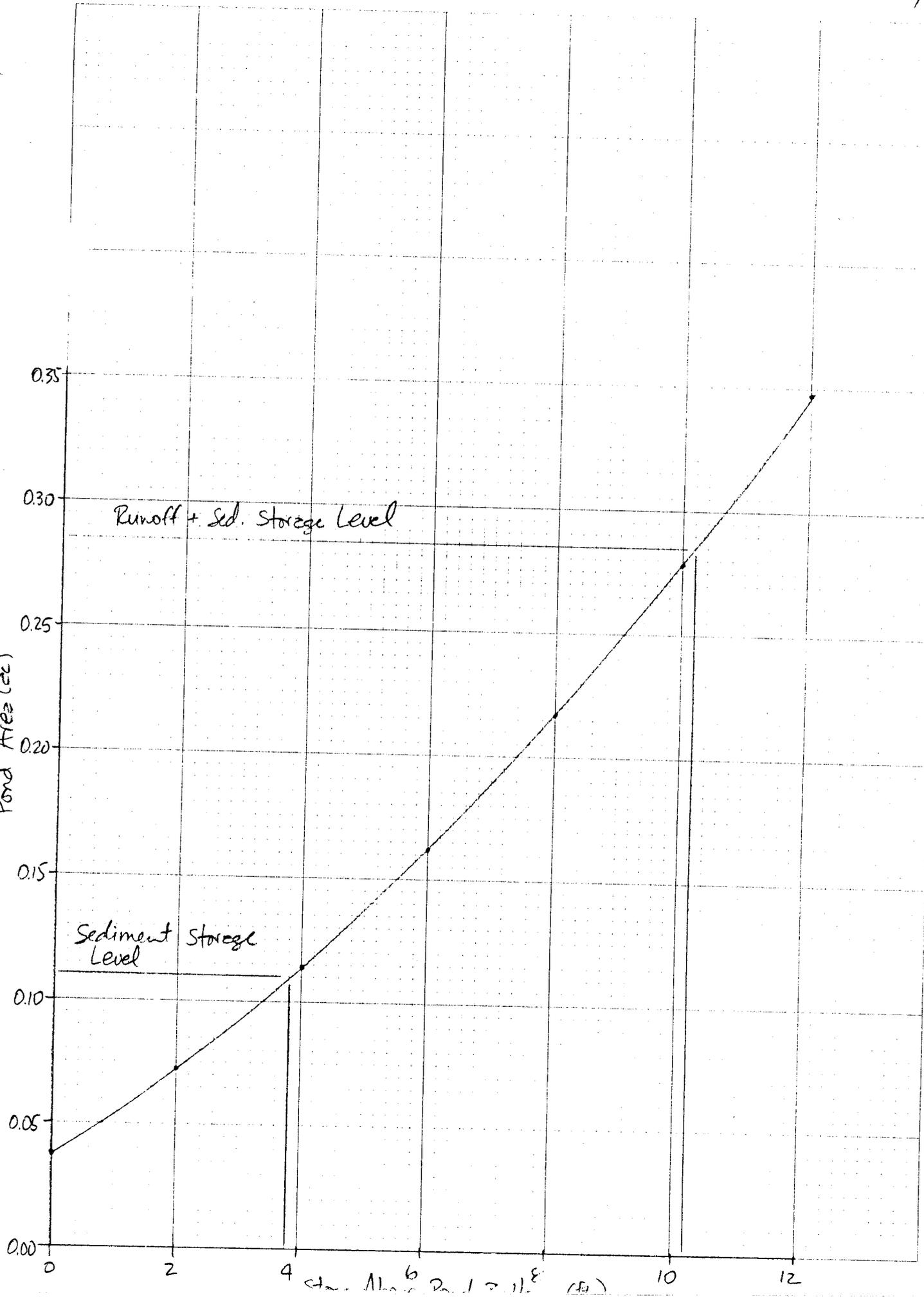
12 values (see stage-area curve on pg. 11 of this calc.)

Number of continuous stirred reactors = 2

46 0700

10 X 10 TO THE INCH • 7 X 12 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Pond Area (ac)



Runoff + Sed. Storage Level

Sediment Storage Level

4 6 8 10 12

Stage-discharge curve to be computed by SEDIMOT II :

Assume Barrel diameter = 18 in
Riser diameter = 30 in
Barrel length = 150 ft

Entrance loss coefficient = 1.0

Bend loss coefficient = 0.5

Weir flow coefficient = 3.1

Orifice flow coefficient = 0.6

Manning's n of pipe = 0.024

} see Barfield et al. (1981)

Barrel head drop = 5.0 ft

SEDIMOT II results → { Peak inflow = 15.74 cfs
Peak outflow = 10.01 cfs
Peak stage = 7.29 ft (above top of max. sed. storage level).

See results on pp 14 - 22 of this calc.

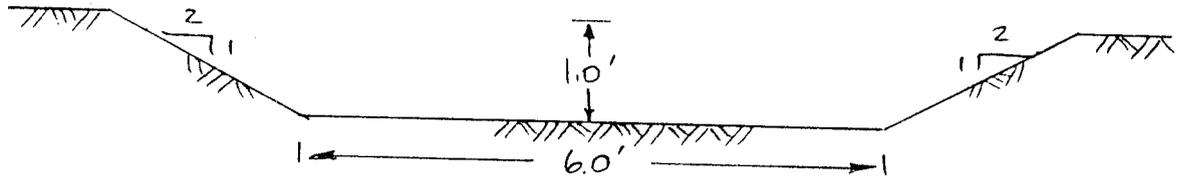
- Height of peak stage above pond bottom = 3.8 ft + 7.3 ft
= 11.1 ft
- Crest of principal spillway (from stage-capacity curve) = 10.2 ft
- Depth of flow over principal spillway = 0.9 ft
- An emergency spillway will be provided as a safety measure even though the emergency spillway will not flow during the 25-yr, 24-hr event. As required by UMC 817.46 (i), the crest of the emergency spillway will be placed 1.0 foot above the crest of the principal spillway.

Principal spillway crest elev. = 5494.2 ft

Emergency spillway crest elev. = 5495.2 ft

The emergency spillway will not be flowing under design conditions. To determine spillway hydraulic performance, assume a peak outflow equal to the peak principal spillway outflow (10.01 cfs).

Assumed emergency spillway cross-section:



The emergency spillway will be located to allow the outflow channel to have a slope equal to the ground slope (0.025 ft/ft). With this bed slope and an assumed Manning's roughness coefficient of 0.030, the following results were obtained using the OSM hydrology design package TRAP1:

Bed Slope =	.025	
Manning's N =	.03	
Bottom Width =	6	feet
Channel Side Slope =	.5	
Flow Depth =	.3863796	feet
Cross Sectional Area =	2.616856	square feet
Wetted Perimeter =	7.727943	feet
Hydraulic Radius =	.3386227	feet
Discharge =	10.01	cubic feet/sec
Velocity =	<u>3.825201</u>	feet/sec
Froude Number =	1.084474	

Acceptable velocity
(non-erosive)

$$\begin{aligned} \text{Elevation of the top of the embankment} &= 5495.2 \text{ ft} \\ &+ 1.0 \text{ ft} \\ \hline &5496.2 \text{ ft} \end{aligned}$$

-- SEDFC --
SEDIMOT II MODEL FOR THE IBM PC/XT
CONVERTED BY TECH ENGINEERING INC.
VERSION 1.10 NOVEMBER 17, 1983

UNIVERSITY OF KENTUCKY COMPUTER MODEL
OF SURFACE MINE HYDROLOGY AND SEDIMENTOLOGY
FOR MORE INFORMATION CONTACT THE AGRICULTURAL
ENGINEERING DEPARTMENT
THE UK MODEL IS A DESIGN MODEL DEVELOPED TO PREDICT
THE HYDRAULIC AND SEDIMENT RESPONSE FROM SURFACE
MINED LANDS FOR A SPECIFIED RAINFALL EVENT (SINGLE STORM)
VERSION DATE 9-23-83
DISCLAIMER: NEITHER THE UNIVERSITY NOR ANY OF ITS EMPLOYEES
ACCEPT ANY RESPONSIBILITY OR LEGAL LIABILITY FOR THE
CONCLUSIONS DRAWN FROM THE RESULTS OF THIS MODEL

- *****
* THE FOLLOWING VALUES ARE NOW PREDICTED BY SEDIMOT II. *
* THEY CAN BE FOUND IN SUMMARY TABLES. *
* 1. PERIOD OF SIGNIFICANT CONCENTRATION *
* 2. VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION *
* DURING PERIOD OF SIGNIFICANT CONCENTRATION *
* 3. VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION *
* DURING PEAK 24 HOUR PERIOD *
* 4. ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION *
* DURING PERIOD OF SIGNIFICANT CONCENTRATION *
* 5. ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION *
* DURING PEAK 24 HOUR PERIOD *
* ALL CONCENTRATIONS ARE IN ML/L. *

WATERSHED IDENTIFICATION CODE

BANNING LOADOUT SEDIMENTATION POND PRINCIPAL SPILLWAY DESIGN

INPUT PARTICLE SIZE-PERCENT FINER DISTRIBUTIONS

SIZE,MM	.150	.100	.050	.010	.005	.001
PCT FINER NO. 1	100.000	94.000	80.000	31.000	20.000	4.000

*****INPUT VALUES*****
STORM DURATION = 24.00 HOURS
PRECIPITATION DEPTH = 2.15 INCHES
SPECIFIC GRAVITY = 2.50
LOAD RATE EXPONENT FACTOR = 1.50
SUBMERGED BULK SPECIFIC GRAVITY = 1.25

JUNCTION 1, BRANCH 1, STRUCTURE 1

***** RESULTS FROM SUBWATERSHED 1 *****

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.1500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	100.0000	100.0000	90.0114	34.8794	22.5029	4.5006
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***
(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	*****	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.000	.000
6.20	.000	.000	*	6.30	.000	.000
6.40	.000	.000	*	6.50	.000	.000
6.60	.000	.000	*	6.70	.000	.000
6.80	.000	.000	*	6.90	.000	.000
7.00	.000	.000	*	7.10	.000	.000
7.20	.000	.000	*	7.30	.000	.000
7.40	.000	.000	*	7.50	.000	.000
7.60	.000	.000	*	7.70	.013	.000
7.80	.017	.000	*	7.90	.022	.000
8.00	.027	.000	*	8.10	.033	.000
8.20	.041	.000	*	8.30	.051	.000
8.40	.060	.000	*	8.50	.069	.000

8.60	.077	.000	*	8.70	.087	.000
8.80	.097	.000	*	8.90	.107	.000
9.00	.116	.000	*	9.10	.126	.000
9.20	.139	.000	*	9.30	.155	.000
9.40	.168	.000	*	9.50	.180	.000
9.60	.192	.000	*	9.70	.209	.000
9.80	.229	.000	*	9.90	.245	.000
10.00	.259	.000	*	10.10	.276	.000
10.20	.308	.000	*	10.30	.350	.000
10.40	.382	.000	*	10.50	.404	.000
10.60	.434	.000	*	10.70	.493	.000
10.80	.570	.000	*	10.90	.626	.000
11.00	.663	.000	*	11.10	.721	.000
11.20	.855	.000	*	11.30	1.038	.000
11.40	1.166	.000	*	11.50	1.247	.000
11.60	1.902	.000	*	11.70	4.709	.000
11.80	9.168	.000	*	11.90	12.567	.000
12.00	14.766	.000	*	12.10	15.739	.000
12.20	13.452	.000	*	12.30	9.098	.000
12.40	6.556	.000	*	12.50	5.606	.000
12.60	4.763	.000	*	12.70	3.770	.000
12.80	2.797	.000	*	12.90	2.358	.000
13.00	2.230	.000	*	13.10	2.106	.000
13.20	1.912	.000	*	13.30	1.692	.000
13.40	1.582	.000	*	13.50	1.545	.000
13.60	1.501	.000	*	13.70	1.406	.000
13.80	1.286	.000	*	13.90	1.223	.000
14.00	1.201	.000	*	14.10	1.167	.000
14.20	1.078	.000	*	14.30	.962	.000
14.40	.899	.000	*	14.50	.875	.000
14.60	.858	.000	*	14.70	.846	.000
14.80	.839	.000	*	14.90	.837	.000
15.00	.838	.000	*	15.10	.839	.000
15.20	.840	.000	*	15.30	.841	.000
15.40	.841	.000	*	15.50	.842	.000
15.60	.843	.000	*	15.70	.844	.000
15.80	.844	.000	*	15.90	.845	.000
16.00	.846	.000	*	16.10	.829	.000
16.20	.751	.000	*	16.30	.639	.000
16.40	.576	.000	*	16.50	.552	.000
16.60	.533	.000	*	16.70	.520	.000
16.80	.512	.000	*	16.90	.511	.000
17.00	.511	.000	*	17.10	.511	.000
17.20	.511	.000	*	17.30	.512	.000
17.40	.512	.000	*	17.50	.512	.000
17.60	.512	.000	*	17.70	.513	.000
17.80	.513	.000	*	17.90	.513	.000
18.00	.513	.000	*	18.10	.514	.000
18.20	.514	.000	*	18.30	.514	.000
18.40	.514	.000	*	18.50	.515	.000
18.60	.515	.000	*	18.70	.515	.000
18.80	.515	.000	*	18.90	.516	.000
19.00	.516	.000	*	19.10	.516	.000
19.20	.516	.000	*	19.30	.517	.000
19.40	.517	.000	*	19.50	.517	.000
19.60	.517	.000	*	19.70	.517	.000
19.80	.518	.000	*	19.90	.518	.000
20.00	.518	.000	*	20.10	.509	.000
20.20	.469	.000	*	20.30	.412	.000
20.40	.380	.000	*	20.50	.368	.000
20.60	.358	.000	*	20.70	.352	.000
20.80	.348	.000	*	20.90	.347	.000
21.00	.347	.000	*	21.10	.347	.000
21.20	.347	.000	*	21.30	.347	.000
21.40	.347	.000	*	21.50	.347	.000

21.60	.347	.000	*	21.70	.347	.000
21.80	.347	.000	*	21.90	.348	.000
22.00	.348	.000	*	22.10	.348	.000
22.20	.348	.000	*	22.30	.348	.000
22.40	.348	.000	*	22.50	.348	.000
22.60	.348	.000	*	22.70	.348	.000
22.80	.348	.000	*	22.90	.348	.000
23.00	.349	.000	*	23.10	.349	.000
23.20	.349	.000	*	23.30	.349	.000
23.40	.349	.000	*	23.50	.349	.000
23.60	.349	.000	*	23.70	.349	.000
23.80	.349	.000	*	23.90	.349	.000
24.00	.350	.000	*	24.10	.331	.000
24.20	.250	.000	*	24.30	.135	.000
24.40	.069	.000	*	24.50	.044	.000
24.60	.024	.000	*	24.70	.011	.000

*** HYDRAULIC INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	AREA ACRES	CURVE NUMBER	TC HR	TT HR	ROUTING COEFFICIENTS K-HRS	X	UNIT HYDRO
1	15.50	90.00	.300	.000	.000	.00	1.0

*** SEDIMENT INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	SEG NUM	SOIL K	LENGTH FEET	SLOPE PCT	CP VALUE	PART OPT	SURF COND
1	1	.00	.0	.00	.000	1.0	.0

POND RESULTS

***** CONTROL VARIABLES OPTIONS *****

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	400	12	2

***** DROP SPILLWAY INPUTS *****

ENTRANCE LOSS COEFFICIENT	=	1.0000	
BEND LOSS COEFFICIENT	=	.5000	
WEIR COEFFICIENT	=	3.1000	
ORIFICE COEFFICIENT	=	.6000	
MANNING COEFFICIENT	=	.0240	
BARREL DIAMATER	=	18.00	INCHES
RISER DIAMETER	=	30.00	INCHES
LENGTH OF PIPE	=	150.00	FEET
VERTICAL HEAD DROP	=	5.00	FEET

***** BASIN GEOMETRY *****

STAGE (FT)	AREA (ACRES)	AVERAGE DEPTH (FT)	DISCHARGE (CFS)	CAPACITY (ACRES-FT)
.00	.110	.00	.00	.00
1.00	.132	.95	.00	.12
2.00	.157	1.87	.00	.27
3.00	.183	2.73	.00	.44
4.00	.211	3.56	.00	.63
5.00	.240	4.35	.00	.86
6.00	.271	5.12	.00	1.11
6.40	.285	5.42	.00	1.22
6.70	.295	5.64	4.00	1.31
7.00	.305	5.86	9.76	1.40
7.50	.321	6.22	10.19	1.56
8.00	.339	6.57	10.60	1.72

***** STORM EVENT SUMMARY *****

```

-----
TURBULENCE FACTOR = 1.00
PERMANENT POOL CAPACITY = 1.225 ACRE-FT
DEAD STORAGE = 20.00 PERCENT
TIME INCREMENT OUTFLOW = .10 HRS
VISCOSITY = .009 CM**2/SEC
INFLOW RUNOFF VOLUME = 1.580 ACRE-FT
OUTFLOW ROUTED VOLUME = 1.580 ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW) = 1.580 ACRE-FT
POND VOLUME AT PEAK STAGE = 1.492 ACRE-FT
PEAK STAGE = 7.288 FT
PEAK INFLOW RATE = 15.739 CFS
PEAK DISCHARGE RATE = 10.007 CFS
PEAK INFLOW SEDIMENT CONCENTRATION = .00 MG/L
PEAK EFFLUENT SEDIMENT CONCENTRATION = .00 MG/L
PEAK EFFLUENT SETTLEABLE CONCENTRATION = .0000 ML/L
PEAK EFFLUENT SETTLEABLE CONCENTRATION = .00 MG/L
STORM AVERAGE EFFLUENT CONCENTRATION = .00 MG/L
AVERAGE EFFLUENT SEDIMENT CONCENTRATION = .00 MG/L
BASIN TRAP EFFICIENCY = ***** PERCENT
DETENTION TIME OF FLOW WITH SEDIMENT = .26 HRS
DETENTION TIME FROM HYDROGRAPH CENTERS = .26 HRS
DETENTION TIME INCLUDING STORED FLOW = .26 HRS
SEDIMENT LOAD DISCHARGED = .00 TONS
PERIOD OF SIGNIFICANT CONCENTRATION = -26.20 HRS
VOLUME WEIGHTED AVERAGE SETTLEABLE
  CONCENTRATION DURING PERIOD OF
  SIGNIFICANT CONCENTRATION = .00 ML/L
VOLUME WEIGHTED AVERAGE SETTLEABLE
  CONCENTRATION DURING PEAK 24 HOUR
  PERIOD = .00 ML/L
ARITHMETIC AVERAGE SETTLEABLE
  CONCENTRATION DURING PERIOD OF
  SIGNIFICANT CONCENTRATION = .00 ML/L
ARITHMETIC AVERAGE SETTLEABLE
  CONCENTRATION DURING PEAK 24 HOUR
  PERIOD = .00 ML/L
*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***
SIZE,MM .1500 .1000 .0500 .0100 .0050 .0010
PERCENT FINER .0000 .0000 .0000 .0000 .0000 .0000
SIZE,MM .0001
PERCENT FINER .0000

```

*** HYDROGRAPH AND SEDIMENT GRAPH ***
(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	***** *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.000	.000
6.20	.000	.000	*	6.30	.000	.000
6.40	.000	.000	*	6.50	.000	.000
6.60	.000	.000	*	6.70	.000	.000
6.80	.000	.000	*	6.90	.000	.000
7.00	.000	.000	*	7.10	.000	.000
7.20	.000	.000	*	7.30	.000	.000
7.40	.000	.000	*	7.50	.000	.000
7.60	.000	.000	*	7.70	.002	.000
7.80	.006	.000	*	7.90	.010	.000
8.00	.015	.000	*	8.10	.020	.000
8.20	.025	.000	*	8.30	.032	.000
8.40	.039	.000	*	8.50	.047	.000
8.60	.055	.000	*	8.70	.064	.000
8.80	.073	.000	*	8.90	.082	.000
9.00	.092	.000	*	9.10	.101	.000
9.20	.111	.000	*	9.30	.122	.000
9.40	.135	.000	*	9.50	.147	.000
9.60	.160	.000	*	9.70	.173	.000

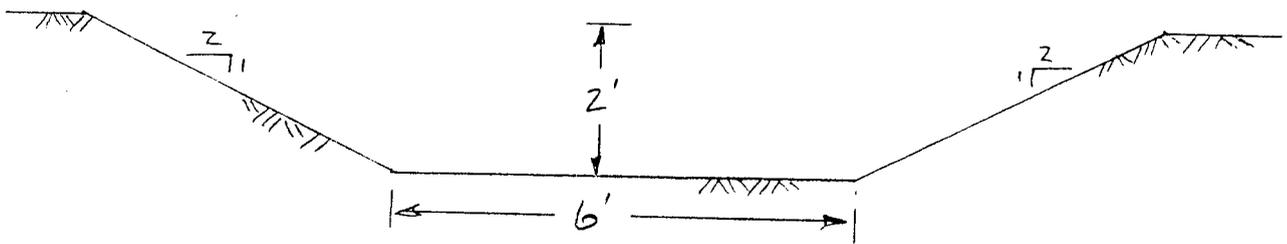
9.80	.187	.000	*	9.90	.203	.000
10.00	.219	.000	*	10.10	.234	.000
10.20	.253	.000	*	10.30	.277	.000
10.40	.306	.000	*	10.50	.333	.000
10.60	.361	.000	*	10.70	.393	.000
10.80	.437	.000	*	10.90	.489	.000
11.00	.538	.000	*	11.10	.587	.000
11.20	.651	.000	*	11.30	.746	.000
11.40	.859	.000	*	11.50	.970	.000
11.60	1.163	.000	*	11.70	1.846	.000
11.80	3.472	.000	*	11.90	6.400	.000
12.00	9.437	.000	*	12.10	9.874	.000
12.20	9.979	.000	*	12.30	10.007	.000
12.40	9.959	.000	*	12.50	9.872	.000
12.60	9.768	.000	*	12.70	7.578	.000
12.80	5.781	.000	*	12.90	4.440	.000
13.00	3.650	.000	*	13.10	3.176	.000
13.20	2.803	.000	*	13.30	2.483	.000
13.40	2.213	.000	*	13.50	2.005	.000
13.60	1.851	.000	*	13.70	1.724	.000
13.80	1.603	.000	*	13.90	1.492	.000
14.00	1.402	.000	*	14.10	1.332	.000
14.20	1.265	.000	*	14.30	1.187	.000
14.40	1.105	.000	*	14.50	1.035	.000
14.60	.981	.000	*	14.70	.940	.000
14.80	.908	.000	*	14.90	.886	.000
15.00	.870	.000	*	15.10	.860	.000
15.20	.853	.000	*	15.30	.849	.000
15.40	.846	.000	*	15.50	.845	.000
15.60	.844	.000	*	15.70	.844	.000
15.80	.844	.000	*	15.90	.844	.000
16.00	.844	.000	*	16.10	.842	.000
16.20	.825	.000	*	16.30	.783	.000
16.40	.727	.000	*	16.50	.675	.000
16.60	.633	.000	*	16.70	.599	.000
16.80	.572	.000	*	16.90	.553	.000
17.00	.539	.000	*	17.10	.530	.000
17.20	.524	.000	*	17.30	.520	.000
17.40	.517	.000	*	17.50	.515	.000
17.60	.514	.000	*	17.70	.514	.000
17.80	.513	.000	*	17.90	.513	.000
18.00	.513	.000	*	18.10	.513	.000
18.20	.513	.000	*	18.30	.513	.000
18.40	.514	.000	*	18.50	.514	.000
18.60	.514	.000	*	18.70	.514	.000
18.80	.514	.000	*	18.90	.515	.000
19.00	.515	.000	*	19.10	.515	.000
19.20	.515	.000	*	19.30	.516	.000
19.40	.516	.000	*	19.50	.516	.000
19.60	.516	.000	*	19.70	.517	.000
19.80	.517	.000	*	19.90	.517	.000

20.00	.517	.000	*	20.10	.516	.000
20.20	.507	.000	*	20.30	.486	.000
20.40	.457	.000	*	20.50	.431	.000
20.60	.409	.000	*	20.70	.392	.000
20.80	.378	.000	*	20.90	.368	.000
21.00	.361	.000	*	21.10	.357	.000
21.20	.353	.000	*	21.30	.351	.000
21.40	.350	.000	*	21.50	.349	.000
21.60	.348	.000	*	21.70	.348	.000
21.80	.348	.000	*	21.90	.348	.000
22.00	.348	.000	*	22.10	.348	.000
22.20	.348	.000	*	22.30	.348	.000
22.40	.348	.000	*	22.50	.348	.000
22.60	.348	.000	*	22.70	.348	.000
22.80	.348	.000	*	22.90	.348	.000
23.00	.348	.000	*	23.10	.348	.000
23.20	.348	.000	*	23.30	.348	.000
23.40	.349	.000	*	23.50	.349	.000
23.60	.349	.000	*	23.70	.349	.000
23.80	.349	.000	*	23.90	.349	.000
24.00	.349	.000	*	24.10	.346	.000
24.20	.328	.000	*	24.30	.285	.000
24.40	.226	.000	*	24.50	.172	.000
24.60	.128	.000	*	24.70	.093	.000
24.80	.065	.000	*	24.90	.044	.000
25.00	.030	.000	*	25.10	.020	.000
25.20	.014	.000	*	25.30	.009	.000
25.40	.006	.000	*	25.50	.004	.000
25.60	.003	.000	*	25.70	.002	.000
25.80	.001	.000	*	25.90	.001	.000

*** RUN COMPLETED ****

Miscellaneous Notes

- ① Leave existing pond in place during ^{initial} construction of the new pond to provide continual sediment control.
- ② Following construction of the new pond, use the excess material removed for the new pond to backfill the existing pond. Backfill in lifts not exceeding 12 inches in thickness and compact the material by repeated passes with a rubber-tired loader and/or sheepfoot roller.
- ③ Regrade the channels leading to the new pond to ensure positive drainage toward the pond. The south channel should be graded with a slope of 0.2% (1 ft of fall in 500 ft) and the west channel should be graded with a slope of ± 1% (1 ft of fall in 100 ft).
- ④ Typical cross section of existing inlet channel (non-conforming sections to be modified during regrading):



Channel capacity with flow depth = 1.5 ft :

$$\left. \begin{aligned} A &= 13.5 \text{ ft}^2 \\ P &= 12.7 \text{ ft} \\ R &= 1.06 \text{ ft} \\ S &= 0.002 \text{ (min.)} \\ n &= 0.023 \text{ (assumed)} \end{aligned} \right\}$$

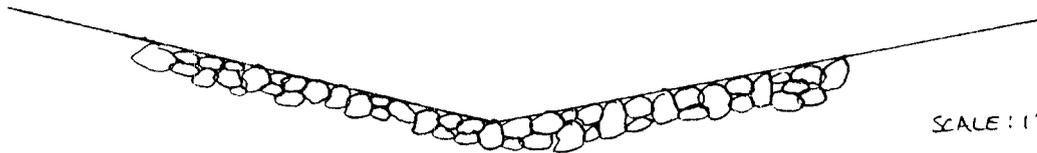
$$V = \frac{1.486}{n} R^{2/3} S^{1/2} \\ = \underline{\underline{3.00 \text{ ft/s}}}$$

→ Non-erosive velocity

$$Q = (3.00 \text{ ft/s})(13.5 \text{ ft}^2)$$

40.5 ft³/s ⇒ OK (in excess of inflow design rate from 25-yr, 24-hr storm - see SEDIMOT II results).

⑤ Inflow to the pond will flow down the southeast and northeast corners of the pond. Check the capacity of this corner channel, assuming riprap is installed for stability:



Capacity with flow depth = 1.0 ft :

$$A = 4.50 \text{ ft}^2$$

$$P = 9.23 \text{ ft}$$

$$R = 0.49 \text{ ft}$$

$$S = 0.235$$

$$n = 0.035 \text{ (assumed)}$$

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

$$= 12.8 \text{ ft/s}$$

$$Q = (12.8)(4.50) = 57.6 \text{ ft}^3/\text{s} \Rightarrow \text{OK (exceeds inflow design rate)}$$

Check the riprap stability ($d_{50} = 6''$ assumed above):

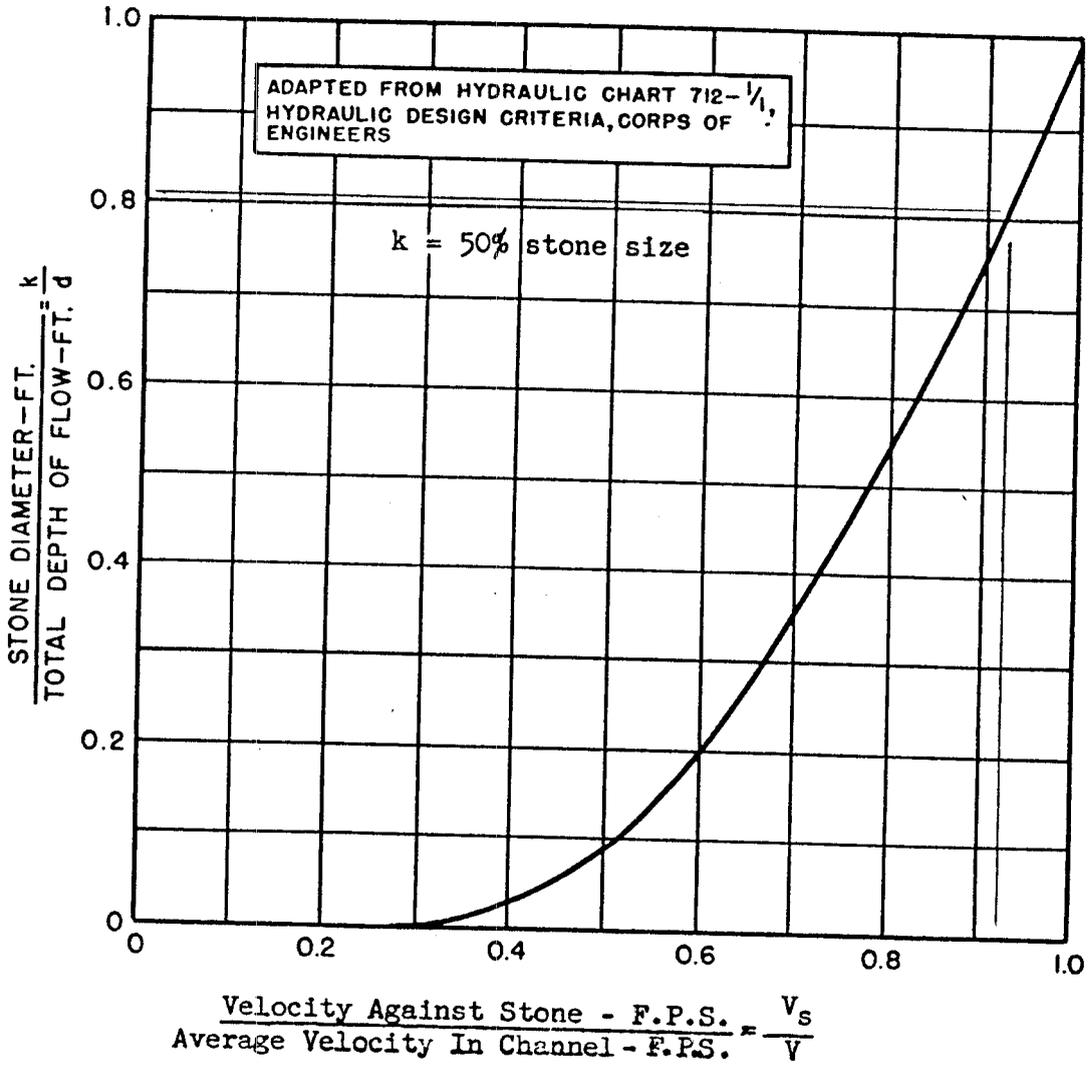
Hydraulic conditions during design inflow event (TRAP1 output), assuming total flow in one channel:

Bed Slope =	.235	
Manning's N =	.035	
Bottom Width =	0	feet
Channel Side Slope =	.222	
Flow Depth =	.6151376	feet
Cross Sectional Area =	1.704479	square feet
Wetted Perimeter =	5.676699	feet
Hydraulic Radius =	.3002588	feet
Discharge =	15.74	cubic feet/sec
Velocity =	9.234494	feet/sec
Froude Number =	2.074909	

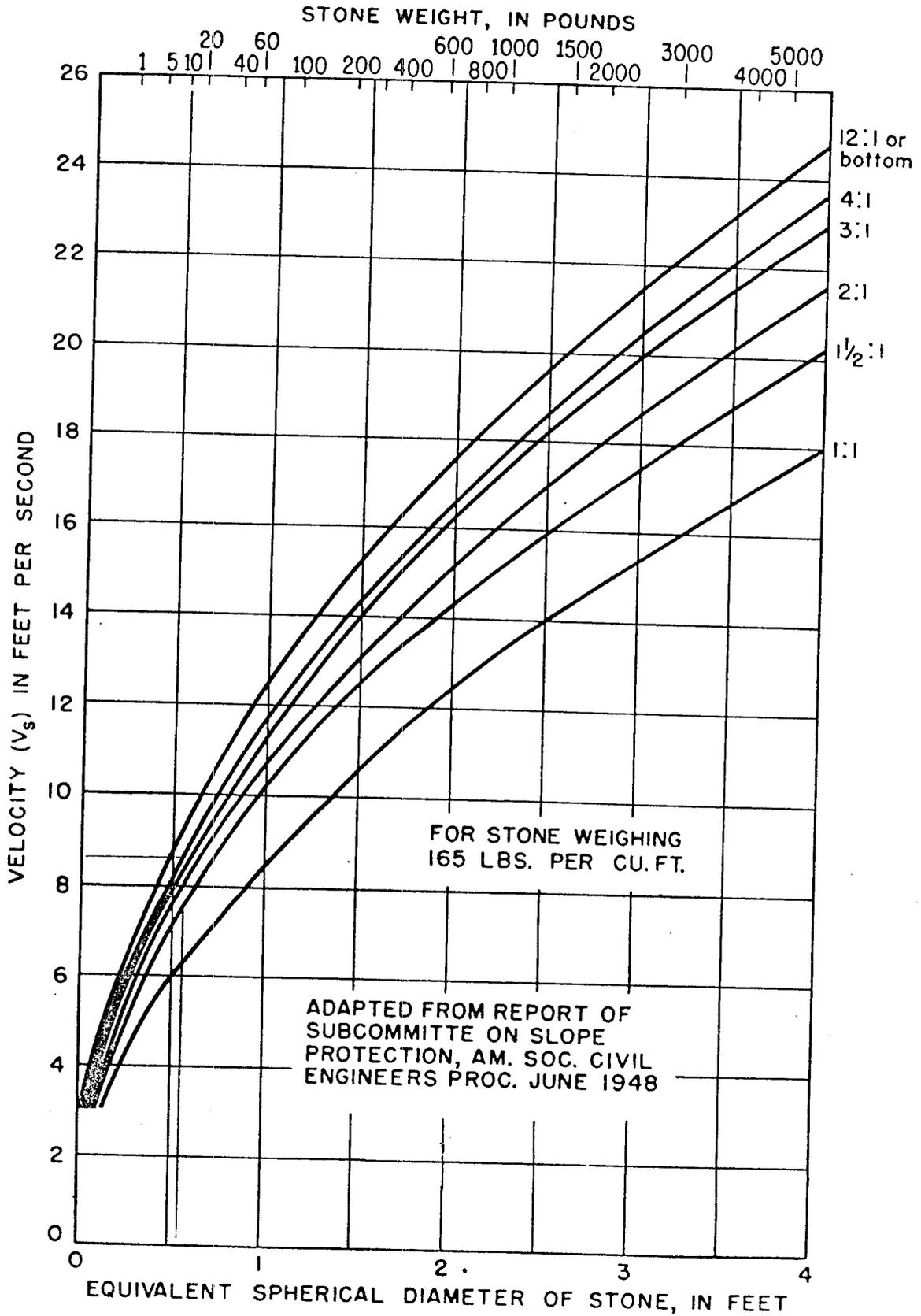
Using the methods of Searcy (1967) - see pages 25 and 26 of this edc.:

$$\frac{\text{Stone diameter}}{\text{Flow depth}} = \frac{0.50}{0.62} = 0.81$$

$$\frac{V_s}{V} = 0.93$$



Source: Searcy (1967)



FOR STONE WEIGHING
165 LBS. PER CU. FT.

ADAPTED FROM REPORT OF
SUBCOMMITTEE ON SLOPE
PROTECTION, AM. SOC. CIVIL
ENGINEERS PROC. JUNE 1948

Source: Searcy (1967)

$$V_s = (0.93)(9.23)$$

$$= 8.6 \text{ ft/s}$$

Channel sideslope $\rightarrow 9:2 \approx 4:1$

Equivalent stone diameter (from chart on pg. 26) = 0.56 ft
= 6.8 in

$$\text{Actual "n" value} \rightarrow n = 0.0395 (d_{50})^{\frac{1}{6}}$$

$$= (0.0395) (0.56)^{\frac{1}{6}}$$

$$= \underline{\underline{0.036}}$$

New channel calcs. with actual "n" value:

Bed Slope =	.235	
Manning's N =	.036	
Bottom Width =	0	feet
Channel Side Slope =	.222	feet
Flow Depth =	<u>.6216357</u>	feet
Cross Sectional Area =	1.74068	square feet
Wetted Perimeter =	5.736665	feet
Hydraulic Radius =	.3034307	feet
Discharge =	15.74	cubic feet/sec
Velocity =	9.042444	feet/sec
Froude Number =	2.02111	

+ freeboard = 1.0 ft
(see Barfield et al., 1981)

Design OK.

⑥ Filter blanket on in-pond channels (Sezrcay, 1967):

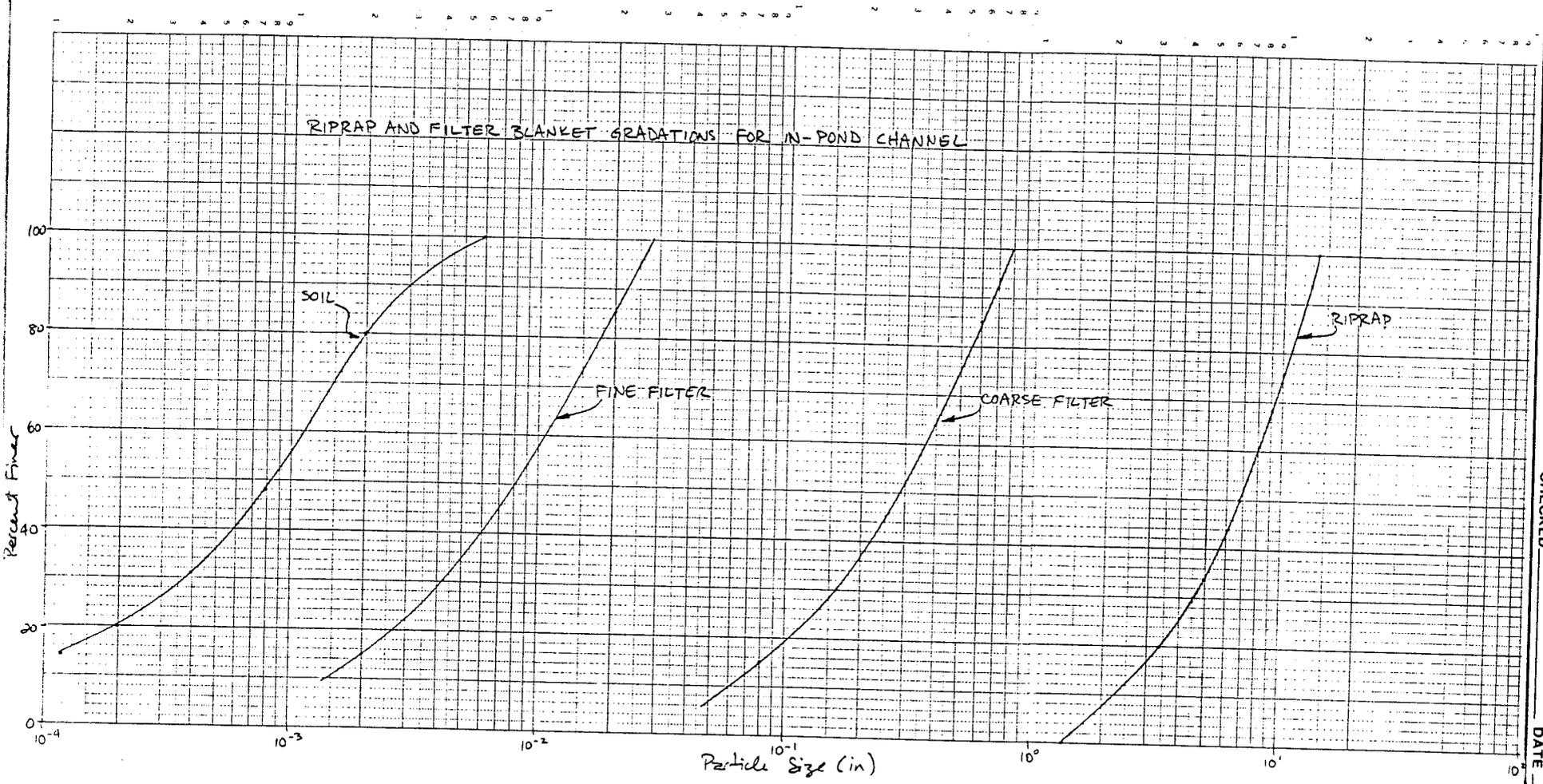
Riprap gradation - see pg. 28 of this calc.

Soil gradation - see pg. 7 of this calc. Also provided on pg. 28

$$\frac{D_{15} \text{ (riprap)}}{D_{85} \text{ (soil)}} = \frac{2.8 \text{ in}}{2.4 \times 10^{-3} \text{ in}} = 1167 > 5 \quad \text{Need filter blanket}$$

Assume gradations for filter blankets provided on pg. 28 of this calc.

RIPRAP AND FILTER BLANKET GRADATIONS FOR IN-POND CHANNEL



$$\frac{D_{15}(R)}{D_{85}(F_1)} = \frac{2.8}{0.6} = 4.67 < 5 \quad \underline{\underline{OK}}$$

$$\frac{D_{15}(R)}{D_{15}(F_1)} = \frac{2.8}{0.08} = 35.0 < 40 \quad \underline{\underline{OK}}$$

$$\frac{D_{15}(F_1)}{D_{85}(F_2)} = \frac{0.08}{0.02} = 4.0 < 5 \quad \underline{\underline{OK}}$$

$$\frac{D_{15}(F_1)}{D_{15}(F_2)} = \frac{0.08}{0.002} = 40.0 = 40 \quad \underline{\underline{OK}}$$

$$\frac{D_{15}(F_2)}{D_{85}(S)} = \frac{0.0020}{0.0024} = 0.8 < 5 \quad \underline{\underline{OK}}$$

$$\frac{D_{15}(F_2)}{D_{15}(S)} = \frac{0.0020}{0.00012} = 16.7 < 40 \quad \underline{\underline{OK}}$$

Thickness of each filter blanket = 6 inches

Thickness of riprap = $2 d_{50} = 13.6$ inches

- ⑦ Make the top width of the embankment portion of the pond at least $(H+35)/5$ in accordance with DOGM regs.
- ⑧ Install marker stakes to indicate elevation of sediment cleanout level.
- ⑨ Compact embankment portion of pond in 6-inch lifts. This portion should have an outside slope of 2:1 and be constructed to an elevation of 5496.5 ft to account for settlement of the lifts (6-ft max. height, increased by 5%).

⑩ Anti-seep collar design - use method of U.S. EPA (1976):

$$L_s = y(z+4) \left[1 + \frac{S_p}{0.25-S_p} \right]$$

where L_s = length of spillway conduit pipe in saturated zone (ft)

y = distance from upstream invert of conduit pipe to top of riser (ft)

z = tangent of upstream embankment slope

S_p = slope of conduit pipe (ft/ft)

For the Banning Loadout pond:

$$\left. \begin{array}{l} y = 5.0 \text{ ft} \\ z = 3.0 \\ S_p = 0.01 \text{ ft/ft} \end{array} \right\} L_s = 36.5 \text{ ft}$$

From the nomograph on pg. 31 of this code:

2 anti-seep collars

Collar projection = 0.95 ft \Rightarrow use 1.0 ft

Collar size = 3.4 ft

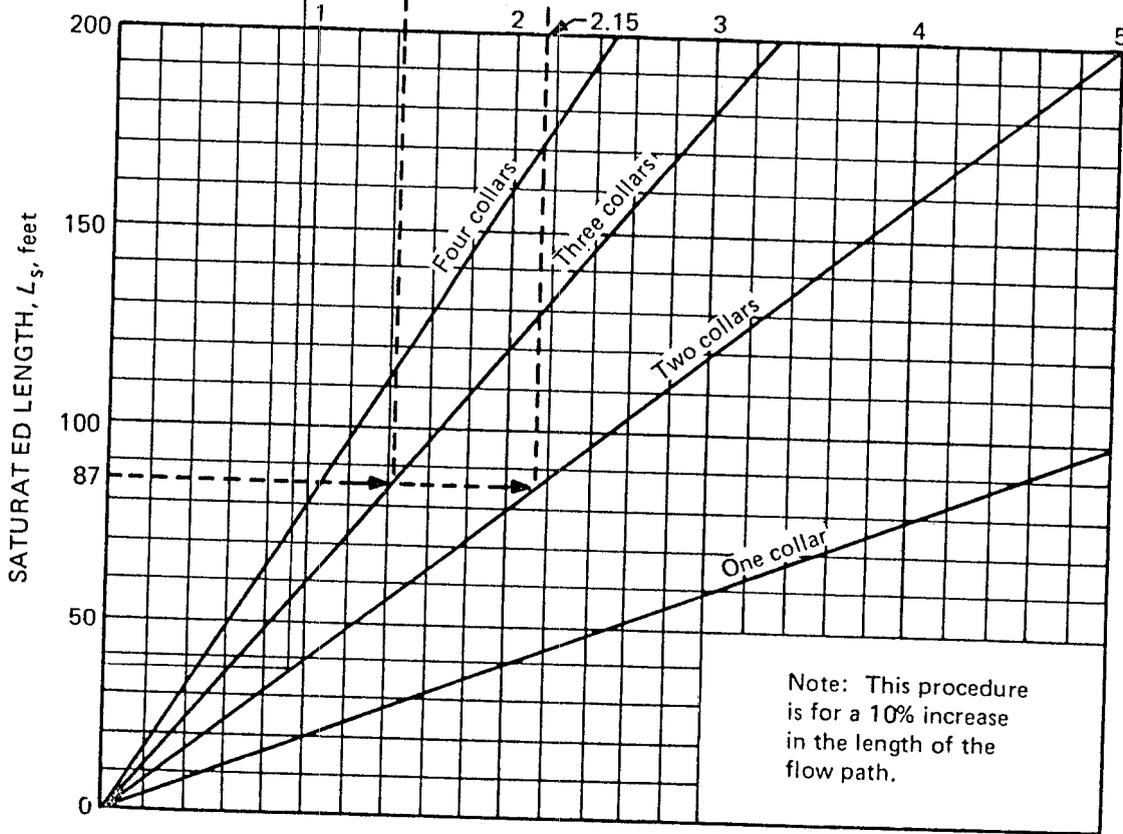
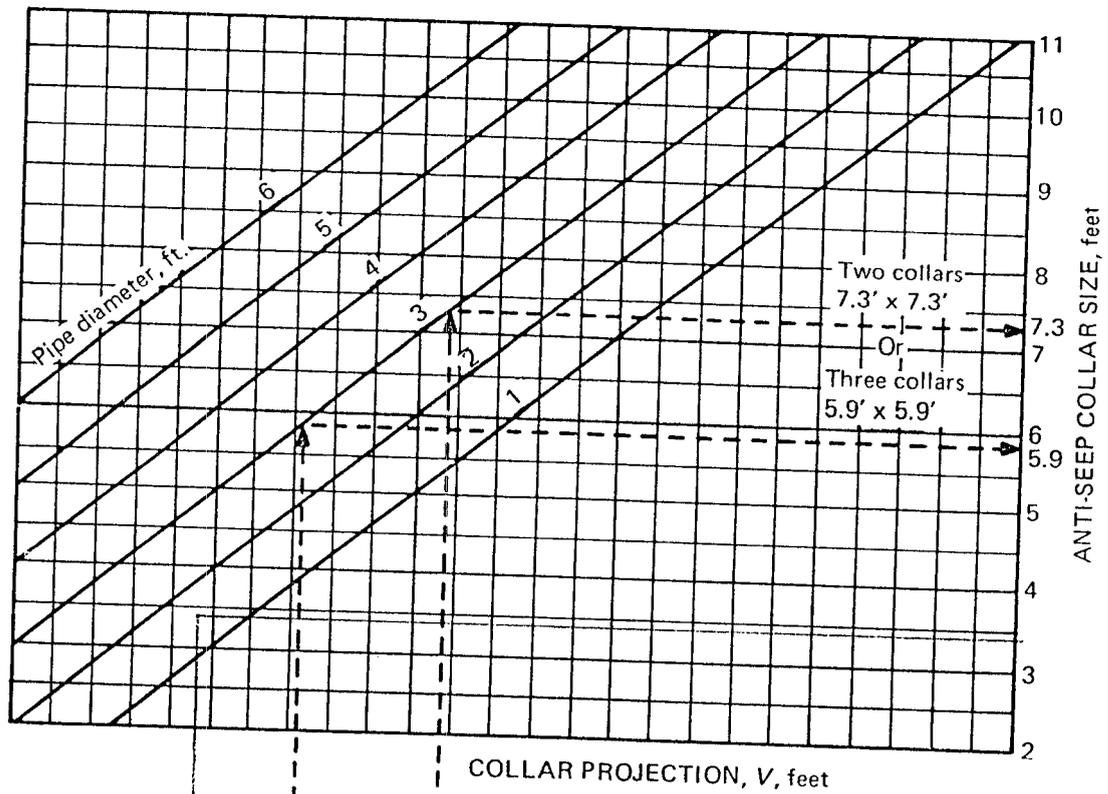
Maximum collar spacing = (1.0 ft)(14) = 14.0 ft.

Use spacing of 13 ft.

References

Barfield, B.J., R.C. Warner, and C.T. Haan. 1981. Applied Hydrology and Sedimentology for Disturbed Areas. Oklahoma Technical Press. Stillwater, Oklahoma.

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Source: U.S. EPA (1976)

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APPENDIX III

Riprap Splash Apron Calculations

EROSION PROTECTION FOR
PRINCIPAL SPILLWAY OUTLET

Methodology

According to the nomograph on pg. 2 of this calc., any 18" culvert carrying a discharge of 10 cfs on a slope of less than 3% will be flowing full. Under full-flow conditions, the methodology of the U.S. EPA (1976) can be used to design a riprap apron. This methodology will be used.

Design

Tailwater depth downstream from the principal spillway outlet was calculated using the OSM hydrology design package TRAP1. Accordingly:

Bed Slope =	.007	
Manning's N =	.03	
Bottom Width =	3	feet
Channel Side Slope =	1	
Flow Depth =	.8642908	feet
Cross Sectional Area =	3.339871	square feet
Wetted Perimeter =	5.444584	feet
Hydraulic Radius =	.61343	feet
Discharge =	10.01	cubic feet/sec
Velocity =	2.997122	feet/sec
Froude Number =	.5681285	

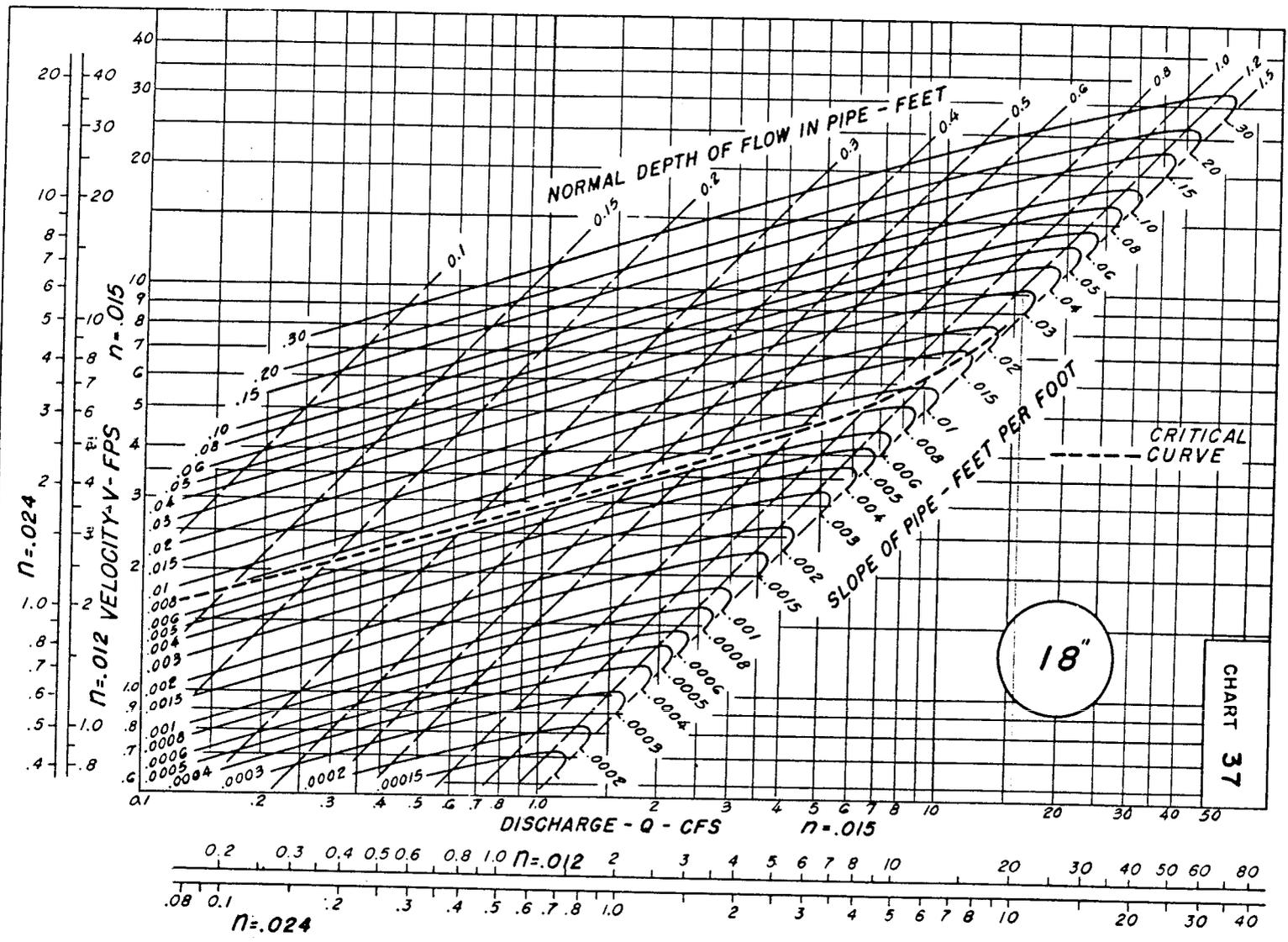
With a tailwater depth of 0.86 ft, $TW > 0.5d$. Thus, use the nomograph on pg. 3 of this calc. to determine required riprap sizing and apron dimensions.

$$D_{50} = 0.09 \text{ ft} = 1.1 \text{ in}$$

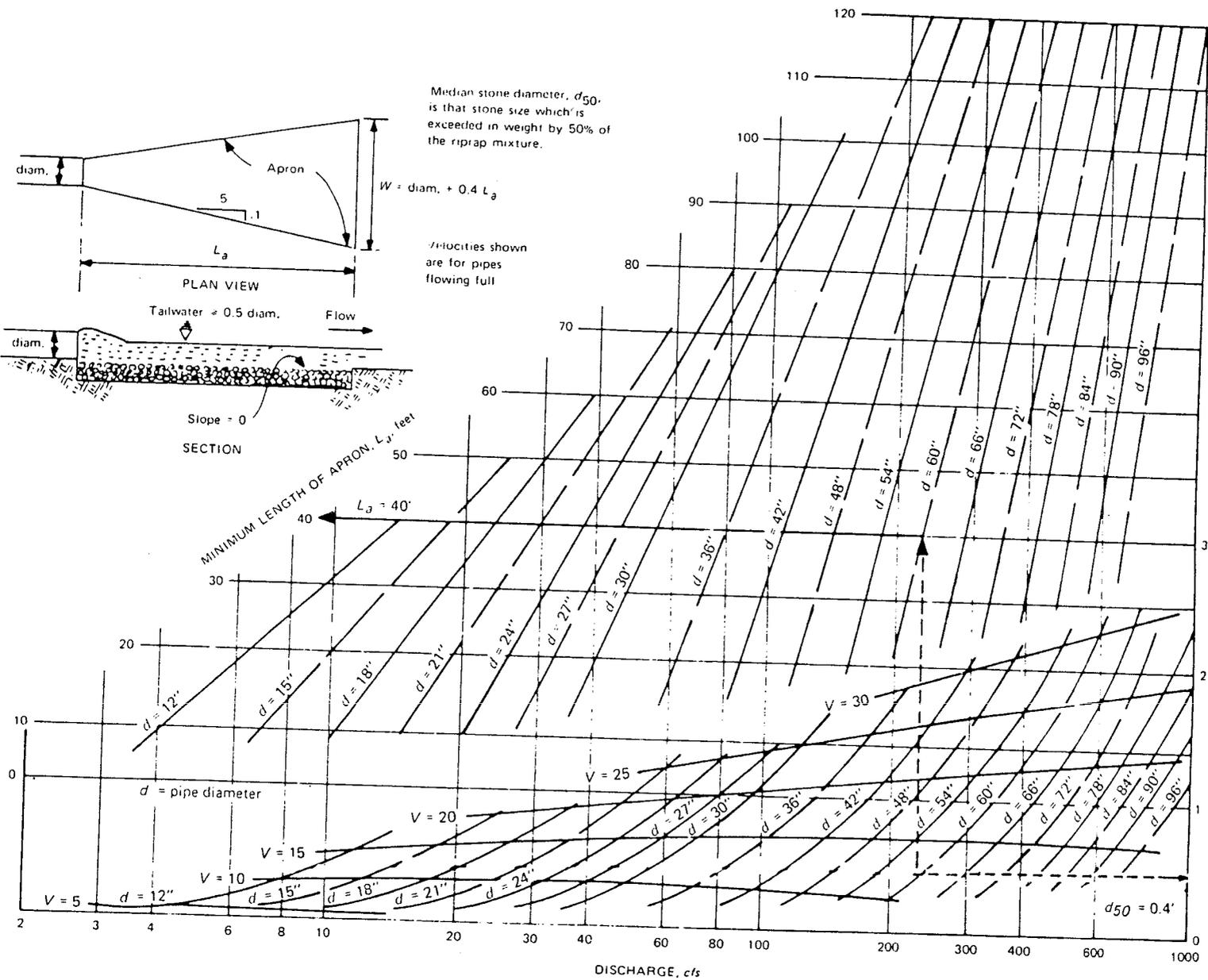
$$\text{Maximum apron length } (L_a) = 9.5 \text{ ft}$$

$$\begin{aligned} \text{Apron width} &= 1.5' + (0.4)(9.5') \\ &= 5.3 \text{ ft} \end{aligned}$$

PIPE FLOW CHART
18-INCH DIAMETER



Source: U.S. DOT (1961)



Design of outlet protection—maximum tailwater condition ($T_w \geq 0.5 \text{ diam.}$)

Source: U.S. EPA (1976)

Use the filter blankets designed for the in-pond channels of the sedimentation pond (see pg. 5 of this calc.). Check stability:

$$\frac{D_{15} (R)}{D_{85} (F)} = \frac{0.45}{0.60} = 0.75 < 5 \quad \underline{\underline{OK}}$$

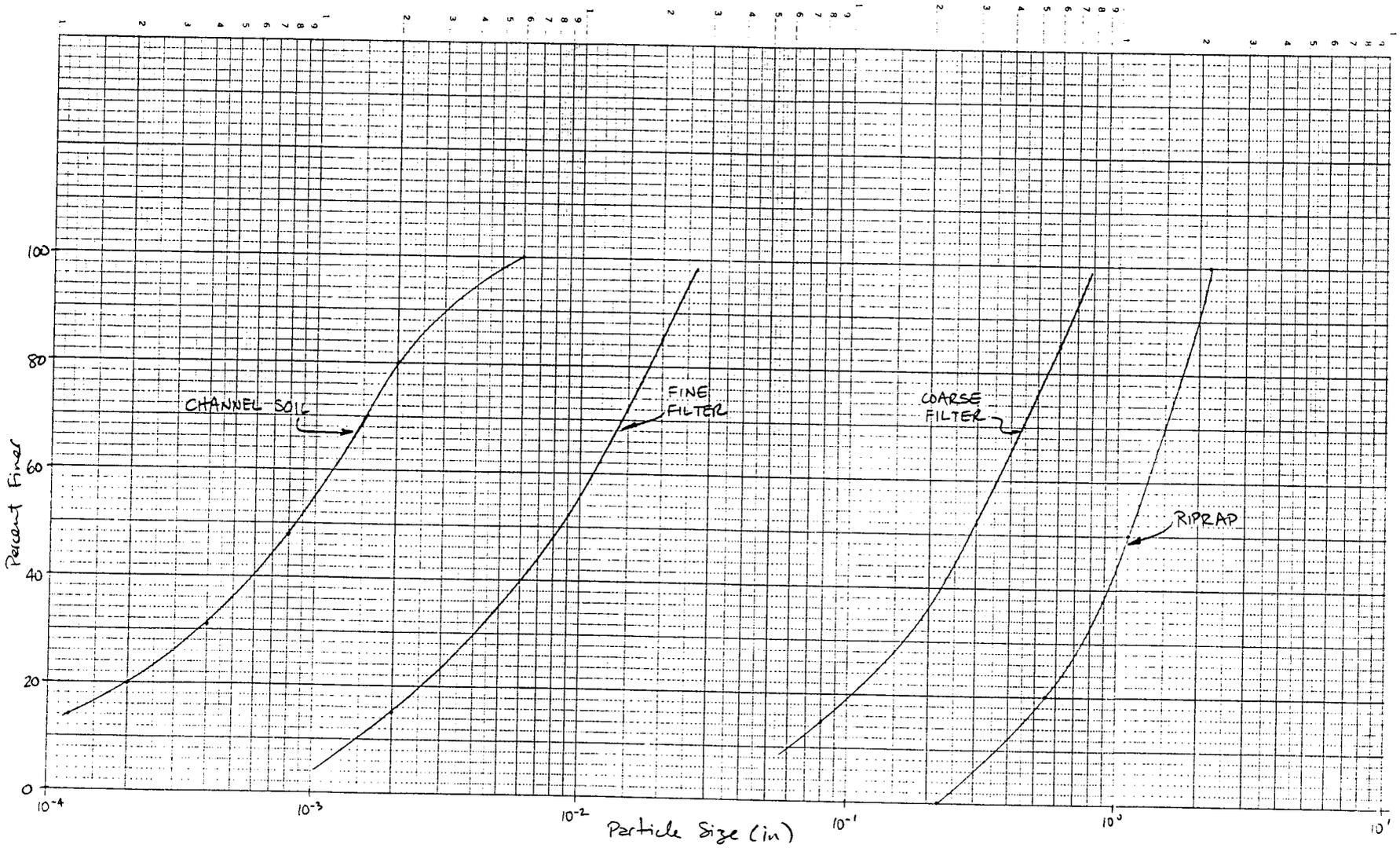
$$\frac{D_{15} (R)}{D_{15} (F)} = \frac{0.45}{0.08} = 5.6 < 40 \quad \underline{\underline{OK}}$$

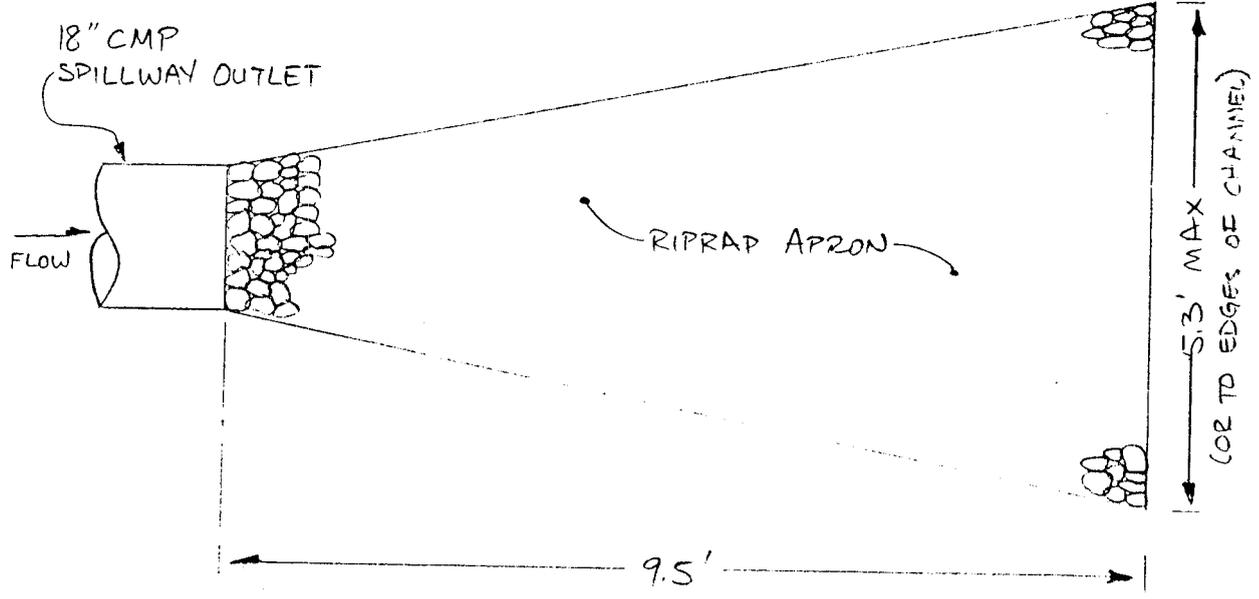
Stability between coarse and fine filter and fine filter and soil determined to be acceptable in sed. pond calcs. Thus, the apron will be stable as designed.

Apron plan and cross section — see pg. 6 of this calc.

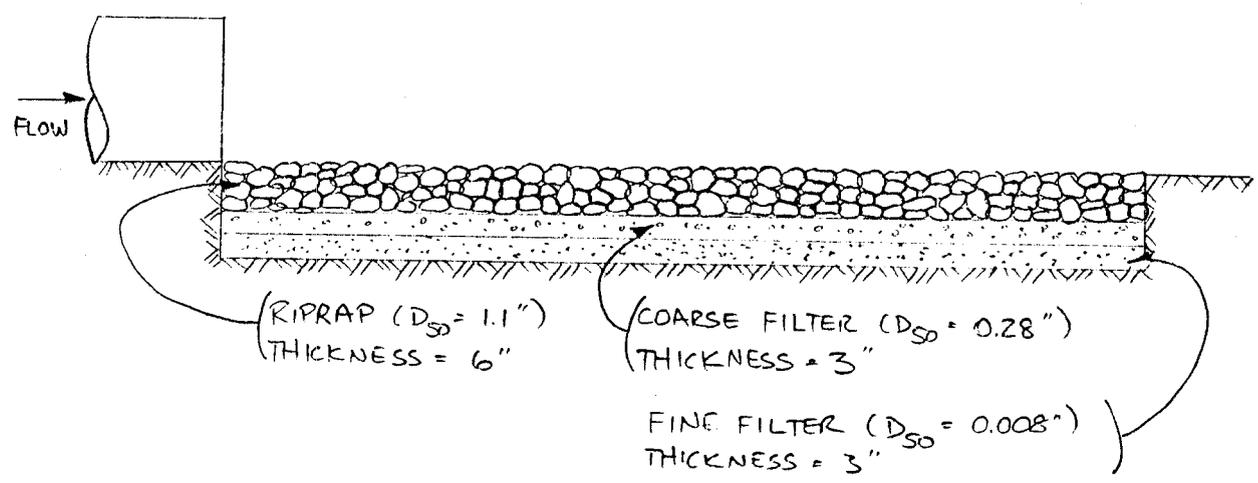
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RIPRAP APRON
PLAN VIEW
SCALE: 1" = 2'



RIPRAP APRON PROFILE
SCALE: 1" = 2'

APPENDIX IV
Soils Information

TDA

~~93~~--Ravola-Slickspots complex

This map unit is on alluvial fans and flood plains. It is located in the vicinity of Sunnyside Junction, in drainages from Helper to Wellington and in the Miller Creek area. Slope is 1 to 3 percent. Slopes are 200 to 300 feet in length, concave-convex and single. Elevation is 5,300 to 5,900 feet. The average annual precipitation is 6 to 8 inches, the mean annual air temperature is 48 to 50 degrees F. and the average freeze-free period is 115 to 140 days.

This unit is 70 percent Ravola loam, alkali, 1 to 3 percent slopes, eroded and 20 percent Slickspots and 10 percent other soils. The Slickspots are irregularly shaped. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Billings silty clay loam.

The Ravola soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is mainly greasewood, alkali sacaton, pricklypear, Russian thistle, galleta, and Indian ricegrass.

Typically the surface layer is light brownish gray loam about 8 inches thick. The underlying layer to a depth of 60 inches is light brownish gray loam. This soil is strongly alkaline below 20 inches.

Permeability of the Ravola soil is moderate. Available water capacity is about ^{7.5}~~8~~ to ^{10.5}~~10~~ inches. The water supplying capacity is 4 to 5 inches in areas not irrigated. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium and the hazard of water erosion is moderate. Runoff, originating from adjacent areas, is concentrated in the gullies. Gullies are "V" shaped, 4 to 5 feet deep, and 100 to 400 feet apart. The hazard of soil blowing is moderate.

Slickspots are bare or nearly bare areas. They have a platy very strongly alkaline loam nearly impervious surface layer about 4 inches thick. The underlying layer is light grayish brown loam and silt loam. This layer is strongly saline and moderately alkaline or strongly alkaline. The vegetation is a sparse stand of pickleweed and greasewood.

Most areas of this unit are used for rangeland and wildlife habitat. A few areas are used for urban development and homesites.

The potential plant community on the Ravola soil is ⁴⁰~~80~~ percent grasses, 10 percent forbs, and ⁵⁰~~30~~ percent shrubs. Important plants are alkali sacaton, galleta, seepweed, and black greasewood.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is very hazardous or impractical to attempt range re-vegetation practices on large areas because of low annual precipitation and strong alkali condition of the soil. For critical erosion control, small areas may be mechanically treated and seeded. Plants that may be suitable for critical area seedings are adapted native plants, prostrate kochia, and Russian wildrye.

This map unit is in capability subclass VIIIE, nonirrigated. The Ravola soil is in the Alkali Flat range site. The Slickspots are not placed in a range site.

Ravola series

The Ravola series consists of very deep, well drained, moderately permeable soils on alluvial fans and in narrow valley floors. These soils formed in alluvium derived from shale and sandstone. Slopes are 1 to 6 percent. Elevation is 5,300 to 6,000 feet. Average annual precipitation is 6 to 8 inches, and mean annual air temperature is 48 to 50 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Typic Torrifluvents.

Typical pedon of Ravola loam, 1 to 6 percent slopes, eroded, about 5 miles northeast of Wellington, about 400 feet west and 1,800 feet south of the northeast corner of sec. 14, T. 14 S., R. 11 E.

A1--0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thick platy structure; soft, friable, sticky and plastic; few very fine, fine, and medium roots; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); abrupt wavy boundary.

C1--2 to 23 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; slightly hard,

friable, sticky, and plastic; few very fine, fine, and medium roots; common very fine pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

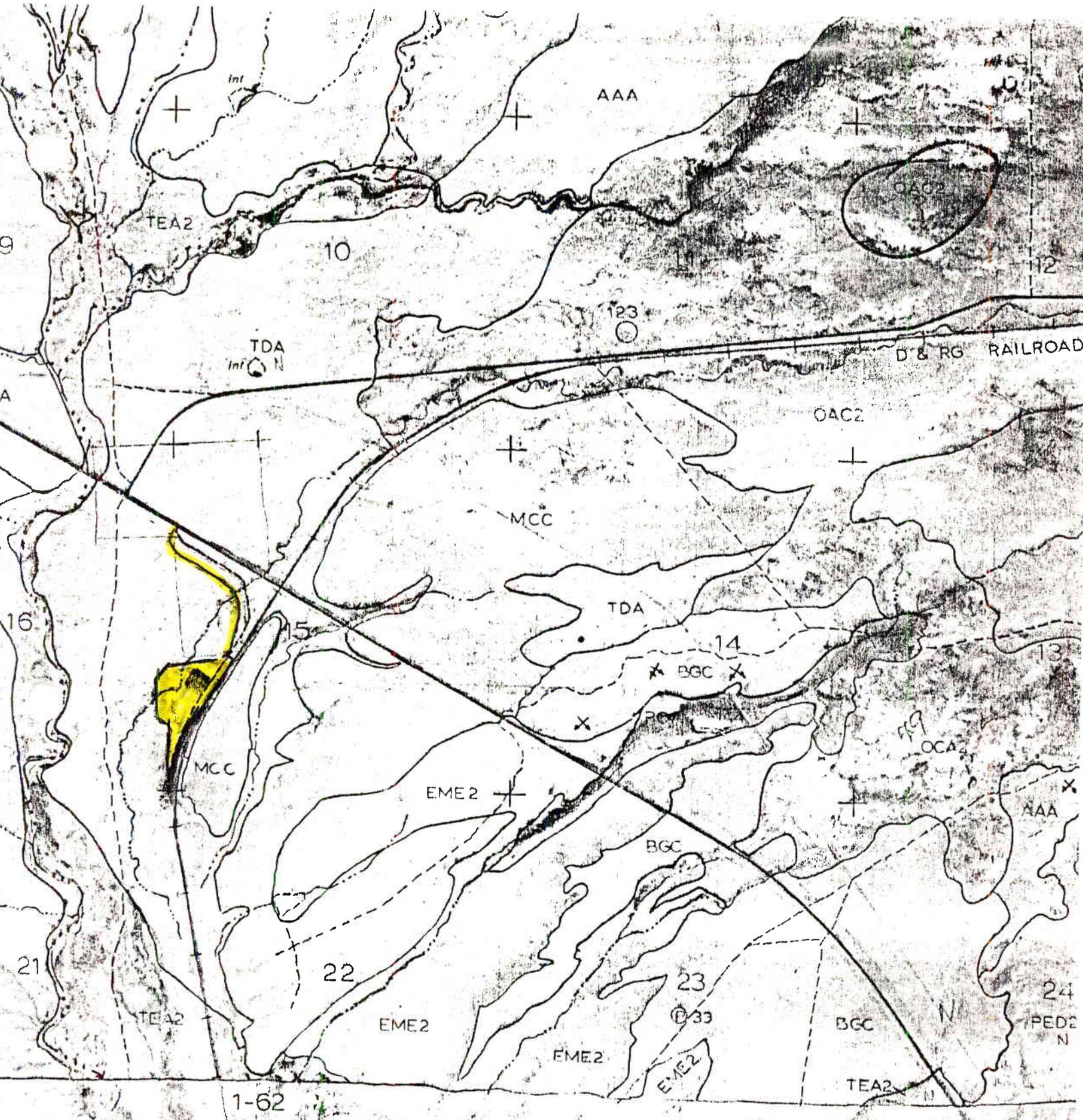
C2--23 to 41 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky, and plastic; few very fine roots; many very fine, common fine, few medium and coarse pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); gradual smooth boundary.

C3--41 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky, and plastic; few very fine roots; many very fine, few fine, medium and coarse pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2).

Hue is 2.5Y or 5Y, value is 6 or 7 dry, and 4 or 5 moist, and chroma is 2 through 4. Carbonate equivalent is 5 to 25 percent. The 10 to 40 inch particle-size control section is loam, silt loam or very fine sandy loam, containing 18 to 27 percent clay.

A horizon: Texture is loam or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

C horizon: Texture is loam or silt loam. Clay content is 18 to 27 percent. Reaction is mildly alkaline, moderately alkaline, or strongly alkaline.



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APPENDIX V
Wildlife Reports



DIVISION OF WILDLIFE RESOURCES

DOUGLAS F. DAY
Director

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

March 16, 1981

Reply To SOUTHEASTERN REGIONAL OFFICE
455 West Railroad Avenue, Box 840, Price, Utah 84501
(801) 637-3310

Mr. Tom Paluso
Soldier Creek Coal Company
P.O. Box I
Price, Utah 84501

Attention: Scott Nordess

Dear Tom:

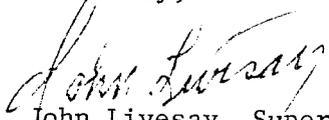
I want to take this opportunity to extend thanks for the assistance your personnel has provided our staff in becoming familiar with facilities on the area encompassed by Soldier Creek Coal Company's Banning loadout facility. I believe that you will find the enclosed information helpful at filing a mine and reclamation plan.

In response to your request for wildlife resource information (UMC 783.20) the attached data and comments are provided. The wildlife resource information is consistent with the formal guidelines for acquisition of fish, wildlife and habitat information provided your Company by Utah's Division of Oil, Gas and Mining. In instances where your Company was required to provide for study beyond existing information, such findings need be merged with our report.

Please note that the enclosed wildlife plan (UMC 784.21) represents our recommendations; Utah's Division of Oil, Gas and Mining is the regulatory authority for approval of the mining and reclamation plan. Implementation of the recommended wildlife plan should assist the Company in compliance with performance standards UMC 817.97.

Thank you for an opportunity to assist your Company in complying with the State's permanent program for coal mining and reclamation and the resultant protection of Utah's wildlife resources. If the Division can be of any further service, please coordinate with our Regional Resource Analyst (Larry Dalton, phone 801-637-3310) as appropriate.

Sincerely,


John Livesay, Supervisor
Southeastern Region

JL:LBD:gp

Attachment

cc: Darrell Nish Clark Johnson
Cleon B. Feight

WILDLIFE BOARD
R. L. Young, Chairman
L. C. Smith, Secretary
W. T. Howard, Treasurer

UMC 783.20; FISH AND WILDLIFE RESOURCE INFORMATION
SOLDIER CREEK COAL COMPANY, BANNING LOADOUT SITE

General Wildlife Resource Information--All Species of Vertebrate Wildlife

The mine plan area encompasses a portion of the San Rafael Swell and Desert in Carbon County, Utah. This area drains into Cottonwood Wash which is a tributary to the Price River, which flows into the Green River and ultimately into the Colorado River at a point upstream from Lake Powell. Generally speaking, the San Rafael Swell and Desert are encompassed by cold desert (upper Sonoran life zone), submontane (Transition life zone) and low elevation montane (Canadian life zone) ecological associations. These life zones could be inhabited on occasion and during different seasons of the year by about 336 species of vertebrate wildlife--15 fish species, 7 amphibian species, 14 reptile species, 235 bird species and 65 mammal species. It is interesting to note that 85 percent of these species are protected.

The mine plan area itself is represented by only the upper Sonoran life zone and provides habitat for approximately 142 species of wildlife--no fish species, 4 amphibian species, 14 reptile species, 80 bird species and 44 mammal species. Thirty-eight 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 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 of wildlife habitats relative to high interest species of vertebrate wildlife has been developed (Table 1). 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. Wildlife habitats and use areas ranked as being of critical or high-priority value to wildlife should be protected from surface disturbance, subsidence impacts and human or industrial disturbance. This can be accomplished through development and implementation of a wildlife plan.

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 in 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 disturbance to critical use areas or habitats will result in irreversible changes in species composition and/or biological productivity of an area.

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 form 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 local 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 as 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.

MAPPING

Vegetation and Wildlife Habitats

It is recommended that the Company's primary effort be placed on identifying species of vegetation in each wildlife habitat within the various wildlife use areas for purposes of reclamation. The Division does not have site specific information relative to vegetation types at the mine plan area. However, there are 2 wildlife habitats present--riparian or wetland types and desert scrub. The Company should identify each of these habitat associations on appropriately scaled maps.

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.

Water

Due to demands of state and federal coal mining regulations, the Company will probably be required to identify and appropriately monitor all surface waters for potential impacts from subsidence. This information should be correlated with the wildlife use area information due to the value of water to wildlife.

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.

Macroinvertebrates

The results from studies of macroinvertebrates associated with Cottonwood Wash should not be required for purposes of determining need for stream buffer zones (UNC 817.57). Since the permit application does not identify any plans to discharge polluting effluents into local waters, no data relative to water quality or macroinvertebrates as a pollution index need be presented.

Note, impact avoidance procedures that would protect the integrity of the aquatic resource and associated riparian habitat in Cottonwood Wash need be included with the mine permit application. Of importance would be facility designs that preclude impacts from water pollution on the vegetation community.

Studies relative to macroinvertebrates if desired or needed, must be conducted by a qualified, private consultant.

Fish--Species Occurrence and Use Areas

Aquatic habitats associated with the mine plan area do not support any species of fish.

It is important to note that no species of fish having relative abundances 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 two wildlife habitat types present on the mine plan area wetlands and riparian habitats are ranked as being of critical value to all local wildlife. Such zones are normally associated with drainage bottoms (ephemeral or intermittent), or perennial streams (UMC 700.5), seeps and springs within the upper Sonoran, Transition and Canadian life zones. When compared to all other wildlife habitats the aforementioned situations are considered to represent unique habitat associations (Table 1).

Riparian and wetland areas are highly productive in terms of herbage produced and use 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. This unique habitat type must be identified in the permit application and protected due to its high value for all wildlife.

Quantitative (acreage) and qualitative (condition, successional stage and

trend) data concerning the wildlife habitats in each ecological association should be included as part of the mine permit application.

Amphibians--Species Occurrence and Use Areas

Seven 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 four of these species inhabit the project area (reference the Division Publication No. 78-16). None of the species of amphibians inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

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

Fourteen 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 all of these species inhabit the project area (Reference the Division Publication No. 78-16). None of the species of reptiles inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

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 thirty-five species of birds, 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 eighty of these species inhabit the project area (reference the Division Publication No. 78-16). Twenty-five 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 local area surrounding the project. The bird's substantial valued use area is always associated with open water where it feeds on aquatic wildlife. Thus, this bird would not be expected to utilize the project area. 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. No rookeries or habitat suitable for such are associated with the project.

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; after which 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 four species that may on occasion or during different seasons of the year utilize the riparian habitat associated with 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.

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. (Note, current management of the proposed project area does not allow for waterfowl nesting.) 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) is of high-priority for seclusion and protection of adult waterfowl during their flightless period when they moult. Males may begin the moult in early June and both sexes and the young are capable of flight by mid-August.

It is important to note that agricultural lands producing corn or other small grain crops are of critical value to geese and dabbling duck species on a year-long basis. 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 provides substantial valued habitat for a multitude of raptors--turkey vulture, bald and golden eagles, five species of falcons (prairie, American peregrine and arctic peregrine falcons; Merlin and American kestrel), five species of hawks (red-tailed, Swainson's, rough-legged, ferruginous and marsh hawks) and four species of owls (barn, great horned, burrowing and short-eared 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 time lies between February 1 and August 15. Generally speaking, aeries represent a critical valued site and need protection from significant or continual disturbance

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 on the mine plan and adjacent areas for determination of locations for raptor aerie territories. Such data needs to be merged with information provided within this report.

Golden eagles are a common yearlong resident of the mine plan area. However, the project area does not provide suitable habitat for an aerie territory. (Note, an aerie territory is utilized by one pair of eagles but may contain several nest sites.)

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 limited 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 limited 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 areas.

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. The project area does not provide aerie sites for cliff nesting falcons.

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.

Agricultural areas and adjoining wildlands that are traversed by coal haulage trucks enroute to the loadout site, provide yearlong, substantial valued habitats for ringnecked pheasants. Due to the pheasants complete dependency on agricultural systems, all cultivated fields are ranked as being of critical importance to this species. Pheasants depend primarily on waste grain, corn and other crops for food. They utilize wild grains and insects to a lesser extent. Croplands can provide for all the life requirements of pheasants. High quality habitat must retain adequate cover and food for the birds use throughout the year.

Pheasants 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 the pheasant population.

Although the snowy plover and common snipe can be found on the mine plan area, the plover is only a transient during spring and fall migrations and habitats on the project are such that the snipe would not likely nest.

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. However, habitats on the project area are not suitable for nesting doves. 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 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. The project area is only of limited value to these two species of bluebirds. It is important to note that trees with cavities can be of critical value to bluebirds.

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

Seventy-five 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 forty-four of these species inhabit the project area (Reference the Division Publication No. 78-16). Thirteen species of the mammals inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The cottontail rabbit (mountain cottontail inhabits sites lying between 7,000 and 9,000 feet in elevation and the desert cottontail inhabits 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.

Beaver are yearlong inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is restricted to riparian habitats in the cold desert, submontane and montane (Canadian life zone) ecological associations. Although beaver may traverse Cottonwood Wash, the project provides no other use for this animal. Thus, beaver are not considered inhabitants of the mine plan area.

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.

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 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 long-tailed weasels and the muskrat 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 are restricted to riparian habitats of the cold desert and submontane ecological association; they may be found in Cottonwood Wash. The long-tailed weasel can

be found from the cold desert up into the montane (Canadian and Hudsonian life zones) ecological associations.

The black-footed ferret is a species primarily dependent upon prairie dogs as a prey source. Currently, the ferret's relative abundance is so low that the animal is endangered with extinction. Utah lies on the western edge of the black-footed ferret's historic range. The substantial value use area for this specie 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. The project site does provide habitat for prairie dogs; thus ferrets may be present.

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 both of which inhabit the project area, are dependent upon a suitable prey source.

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

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. The mine plan area provides habitats of limited value where low numbers of deer reside on a yearlong basis.

The project site represents yearlong range for mule deer herd Unit 29.

Pronghorn antelope representing the Iclander herd are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats except urban and park areas in the cold desert and extends up into the pinion-juniper forest of the submontane ecological association. In some situations antelope show longitudinal migrations in response to winter conditions. There are, however, habitats where antelope

reside on a yearlong basis. The project area does support antelope.

During winter and at times of severe snow conditions the portion of the range then inhabited by antelope is ranked as being of critical value. During such a crucial period antelope must be protected from man's disturbance.

Within the yearlong range all riparian habitats are ranked as being of critical value to antelope.

Antelope kid during the month of June. This activity takes place in the area they happen to be when the time for birth occurs. The doe secrets herself from disturbance and predators and drops her kid. The young animal is capable of following the female in a few hours. Protection of the kid antelope from disturbance during the first day following birth is critical for maintenance of antelope 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.

UMC 784.21; FISH AND WILDLIFE PLAN
SOLDIER CREEK COAL COMPANY, BANNING LOADOUT FACILITY

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 two basic wildlife habitats which are inhabited on occasion and during different seasons of the year by about 142 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. 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 tranquillity 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 any fisheries since none are 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 SMC 816.41 through 816.57 and 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 habitats. 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.

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 wildland 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 Potchetsroon 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 wildlife populations and habitats from siltation. Enhancement of existing problem sites or reclamation of disturbed sited 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.

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. Seeding 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 re-established 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. Loafing 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 expertism 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 Procedures 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 ecosystem.

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, moulting and migrating waterfowl.

The integrity of agricultural lands (pastures) associated with the project needs to be improved 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 a 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 for 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.

Agricultural lands 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 animal 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 and pronghorn antelope--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 has 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 of 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.

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 uninhibited 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.

Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority ²	Crucial-Critical ²
	Aquatic Use Areas		
Stream Sections and Lakes ¹	[s-cw-2-4-yl]	[h-cw-2-3-yl]	[c-cw-2-1-yl]
	Terrestrial Use Areas		
Wetlands, Riparian Zones, Seeps and Springs			
Bison	Herd Distribution s-b-yl		Winter Range c-b-wt 12-1 to 4-15 Summer Range c-b-su 4-15 to 11-30

¹ Streams: The first letter (c) identifies one of the four use areas ranking-- c, crucial-critical; h, high-priority; s, substantial value; l, limited value. The second group of letters (cw) identifies the primary type of fishery for which a water is managed--cw, cold water fishery; ww, warm water fishery; ng, non-game fishery. The first number (2) identifies the stream section. The second number (3) identifies one of the six stream classes defined by Utah Division of Wildlife Resources for Utah's State Water Plan. The last letters (yl) identify a need for a yearlong protection of this water.

¹ Lakes: Notations are the same as stream sections except the numeral that identified stream section has been replaced with the name of the body of water.

Game fish species that inhabit the stream sections or lakes are identified on the map overlays.

² The dates given for various use areas or activities of terrestrial wildlife identify when a species is normally present or participating in an activity and also denotes the period when protection from disturbance is needed.

Figures 1. Continued

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority ²	Crucial-Critical ²
Bighorn Sheep Desert (dbs) Rocky Mountain(mbs)	Herd Distribution s-dbs-yl s-dbs-yl	Tallus Slopes (ewes and lambs) h-dbs-yl 1-1 to 12-31 Mesa Tops-- 1 mile radius (rams) h-dbs-yl 1-1 to 10-31	Rutting Season (tallus slopes) c-dbs-rt 11-1 to 12-31 Lambing Season (tallus slopes) c-dbs-la 5-1 to 6-15
Black Bear	Population Distribution s-bb-yl		
Cougar	Population Distribution s-c-yl		
Elk	Herd Distribution s-c-yl	Winter Range h-e-wt 11-1 to 5-15 Summer Range h-e-su 5-16 to 10-31	Winter Range c-e-wt 11-1 to 5-15
Mountain Goat	Herd Distribution s-mg-yl		
Moose	Herd Distribution s-m-yl		Yearlong c-m-yl 1-1 to 12-31
Mule Deer	Herd Unit s-d-yl	Winter Range h-d-wt 11-1 to 5-15 Summer Range h-d-su 5-16 to 10-31	Winter Range c-d-wt 11-1 to 5-15 Summer Range c-d-su 5-16 to 10-31
Pronghorn Antelope	Herd Distribution s-pa-yl	Yearlong Range h-pa-yl 1-1 to 12-31	Winter Season c-pa-wt severe snow conditions Fawning Season c-pa-fa 5-12 to 6-20

Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority ²	Crucial-Critical ²
Terrestrial Use Areas			
Abert Squirrel	Population Distribution s-as-yl		Nest Trees c-as-wt 1-1 to 12-31
Band-tailed Pigeon	Summer Distribution s-btp-su	Intensive Use Area h-btp-su 4-15 to 10-15	Breeding Season c-btp-bs 5-15 to 8-15
Blue Grouse	Population Distribution s-bg-yl	Brooding Area h-bg-b 6-1 to 8-15	Breeding Territory and Nesting (Mountain brush zone) c-bg-btn 3-15 to 6-15 Winter Range (mature, high elevation stands of Douglas fir) c-bg-wt 12-1 to 2-28
California Quail	Population Distribution s-cq-yl		Croplands and Riparian Zones c-cq-yl 1-1 to 12-31 Nesting Season c-cq-n 4-15 to 5-30
Chukar	Population Distribution s-ck-yl		Winter Range c-ck-wt 12-1 to 2-15 Nesting Season c-ck-n 4-1 to 5-30
Cottontail Rabbit Mountain cottontail found above 7,000 feet elevation. Desert cottontail found below 7,000 feet elevation.	Population Distribution s-mc-yl s-dc-yl		Nesting Season c-mc or dc-n 4-1 to 7-31

Figure 1. Continued

Wildlife Use Areas	Use Area Ranking		
	Substantial Value	High-Priority ²	Crucial-Critical ²
Terrestrial Use Areas			
Gambel Quail	Population Distribution s-gq-yl		Riparian Zones c-gq-yl 1-1 to 12-31 Nesting Season c-gq-n 4-15 to 5-30
Merriams Turkey	Population Distribution s-mt-yl	Winter Range h-mt-wt 12-1 to 3-31 Summer Range h-mt-su 6-1 to 11-30	Display and Nesting Area c-mt-n 4-1 to 5-30 Roost Trees (0.5 mile radius buffer zone) c-mt-rt 1-1 to 12-31
Mourning Dove	Population Distribution s-du-su		Nesting Season c-du-n 5-1 to 8-31
Pheasant Ring-necked White-winted	Population Distribution s-rnp-yl s-wp-yl		Croplands and Adjacent Riparian and Wetlands c-rnp or wp-yl 1-1 to 12-31 Nesting Season c-rnp or wp-n 5-15 to 7-15
Ruffed Grouse	Population Distribution s-rg-yl	Summer Range (0.25 miles each side of stream courses) h-rg-su 3-11 to 11-30	Brooding Areas (0.25 miles each side of stream courses) c-rg-b 6-1 to 8-15 Winter Range (clone of mature male Aspen near stream) c-rg-wt 12-1 to 2-28 Drumming Log c-rg-dr

Figure 1. Continued

Wildlife Use Areas	Use Area Ranking		
	Substantial Value	High-Priority ²	Crucial-Critical ²
Terrestrial Use Areas			
Sage Grouse	Population Distribution s-sa-yl	Summer Range s-sa-su 8-16 to 11-14	Strutting Grounds and associated brooding area c-sa-st,b 3-15 to 8-15 Winter Range c-sa-wt 11-15 to 3-14
Snowshoe Hare	Population Distribution s-sh-yl		Nesting Season (spruce-fir and lodgepole pine forests) c-sh-n 4-1 to 8-15
Waterfowl	Population Distribution (all wetlands, stream courses, ponds and lakes) s-wa-yl	Peak Migration (all wetlands, stream courses, ponds and lakes) h-wa-m 3-15 to 5-15 (spring) 8-15 to 10-15 (fall)	Nesting Season c-wa-n 3-15 to 7-15
		Brooding and Mounting Season (all wetlands, stream courses, ponds and lakes) h-wa-bm 7-16 to 8-15	

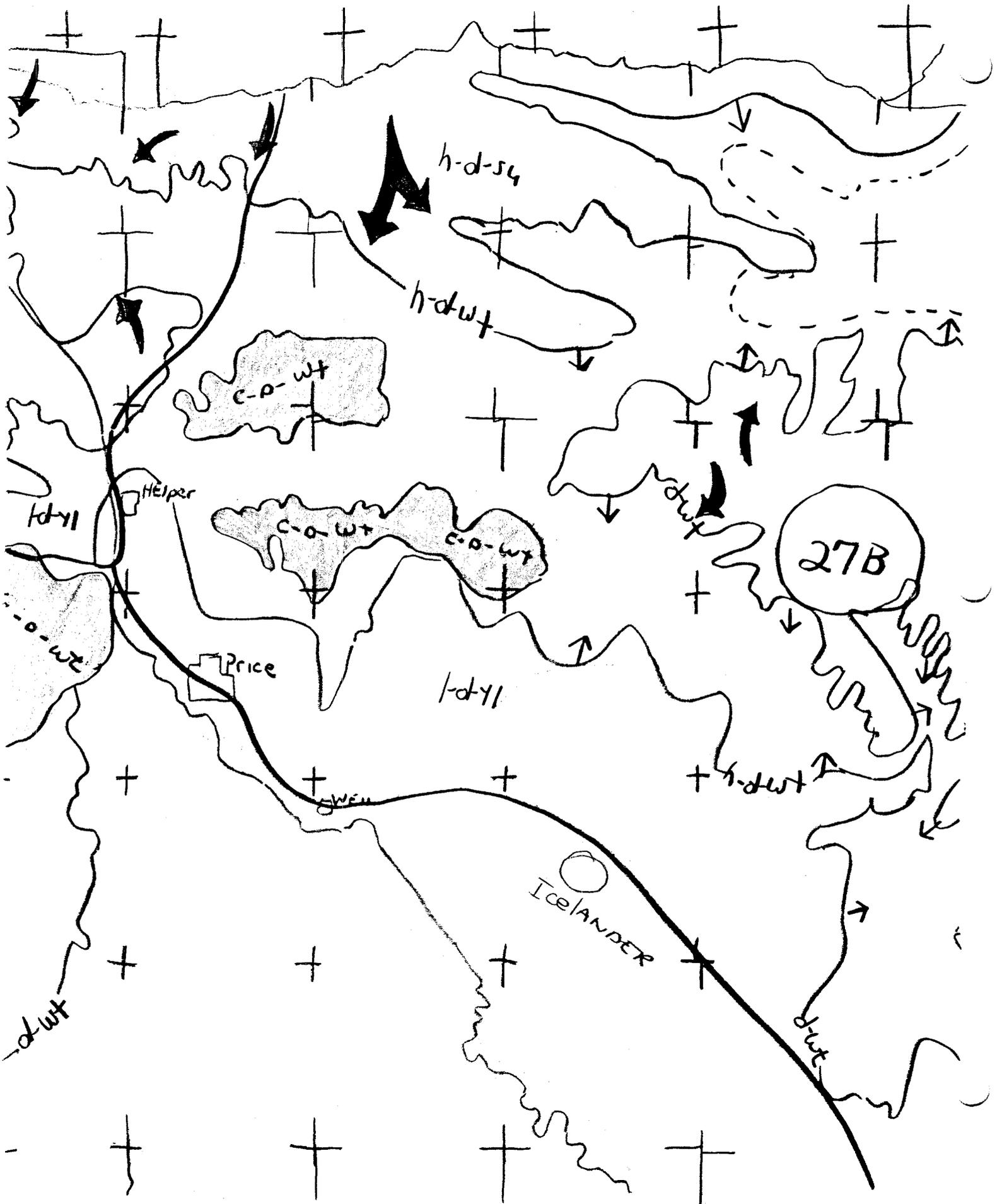
Figure 1. Key for mapable, high-value habitat use areas for wildlife.

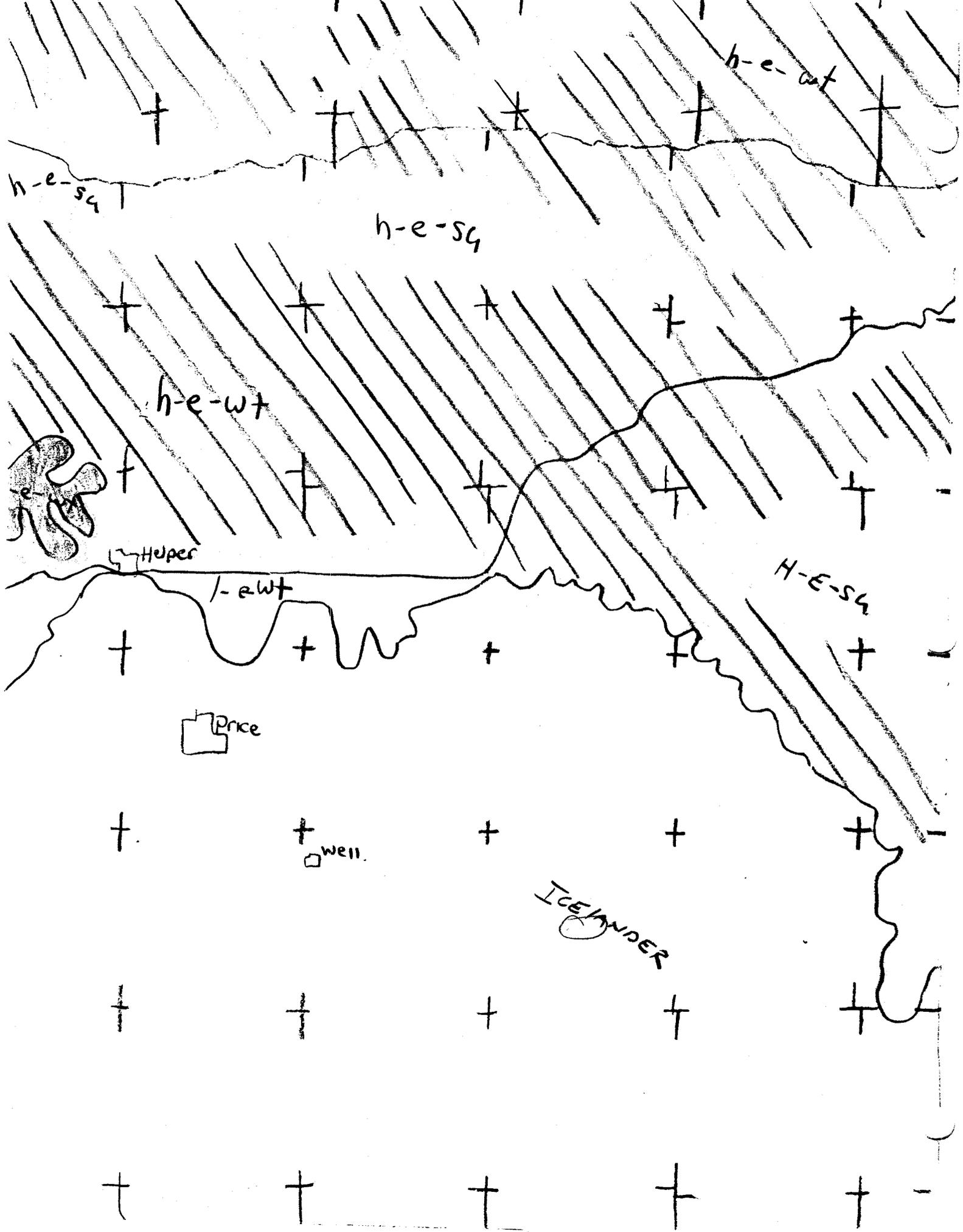
Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority ²	Crucial-Critical ²

Terrestrial Use Areas

Vultures, Accipiters, Buteos (Hawks only), Herriers, Osprey, Merlin, American Kestrel and Owls	Population Distribution (The entire area provides habitat use areas for several species.)	Breeding Territory Surrounds an aerie site	Aerie Site Species specific symbols identified on map-protection needed in 0.25 mile radius buffer zone when in use.
Golden Eagle (common year-around resident)	Population Distribution (The entire area provides habitat use areas for this species.)		Aerie Site 2-15 to 6-15
Bald Eagles	Winter Distribution (Entire area between 11-15 and 3-15 each year)	Winter Concentration h-be-wt 11-15 to 3-15	Roost Tree 11-15 to 3-15
Cliff Nesting Falcon			Aerie Site 3-1 to 6-30







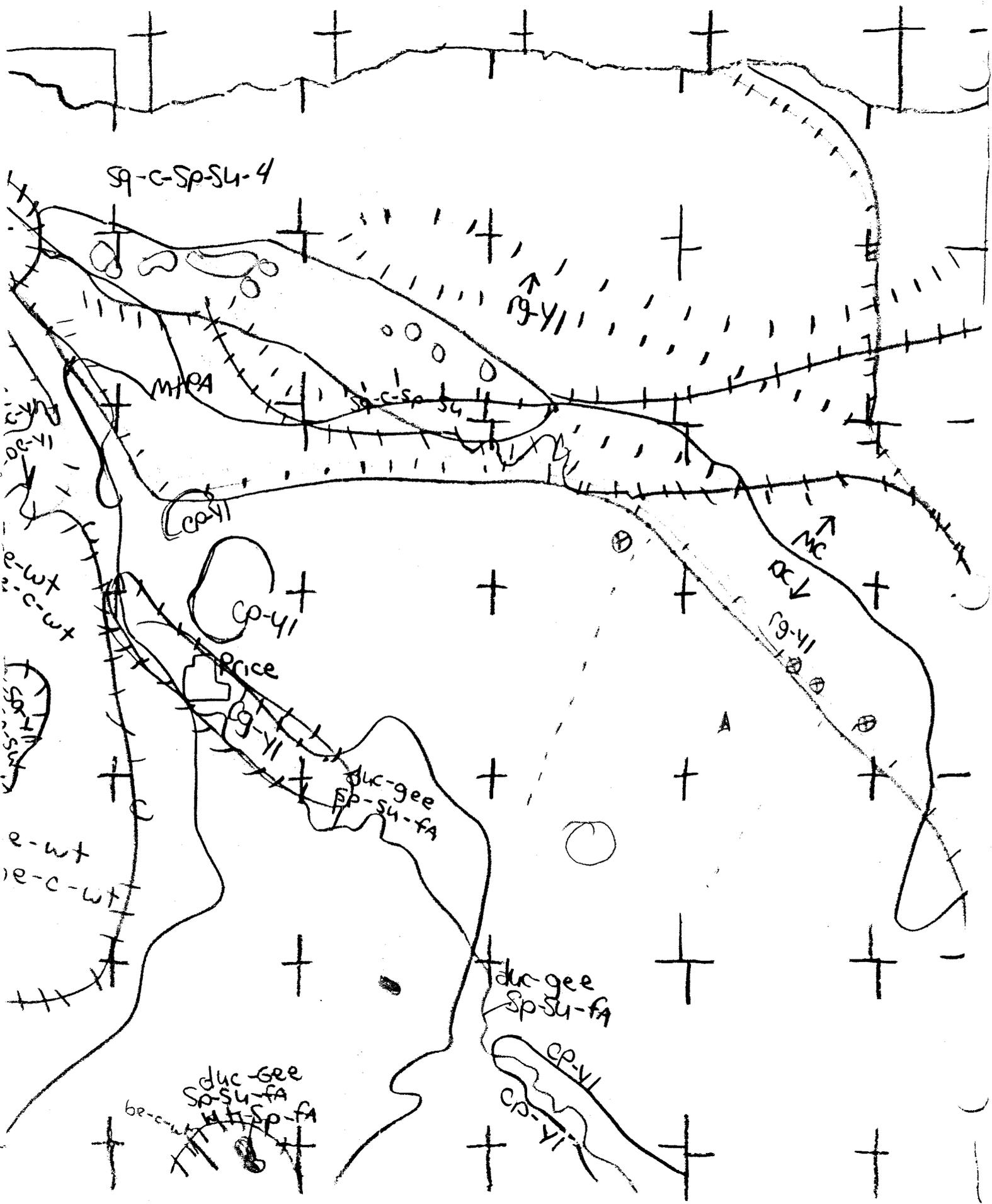


Table 1 Ranking of value per ecological association for wildlife habitats of vertebrate species having high interest to the state of Utah. Crucial-critical (C) habitats are the highest valued followed in respective order by high-priority (H), substantial value (S) and limited valued (L) habitats.

Ecological Association	Wildlife Habitats									
	Riparian and Wetland	Desert Scrub	Pasture and Fields	Urban or Parks	Cliffs and Tallus	Sagebrush P-J Forest	Shrubland	Aspen Forest	Ponderosa Forest	Parkland

Warm Desert LOWER SONORAN LIFE ZONE
This ecological association does not exist in the Southeastern Region

Cold Desert C(H¹, S²) S UPPER SONORAN LIFE ZONE
S S H

Submontane C(H¹, S²) TRANSITION LIFE ZONE
S S H S S S

Montane C(H¹L²) CANADIAN LIFE ZONE
S L S S S S S S

Montane H(S¹, L²) HUDSONIAN LIFE ZONE
S S S S S S S

Montane ALPINE LIFE ZONE
This ecological association does not exist in the Southeastern Region

This Table represents a summation of effort where by numerical values were assigned as a ranking per high interest specie to each wildlife habitat. The numerical values were as follows: critical, 1; high-priority, 2; substantial, 3; and limited, 4. Once the individual values were assigned they were then summed and a mean calculated, for each wildlife habitat. A mean value lying between 1.0 and 1.8 was ranked as critical; a value between 1.9 and 2.3 was ranked as high-priority; a value between 2.4 and 3.4 was ranked as substantial; and a value between 3.5 and 4.0 was ranked as limited.

1. Habitat ranking value for species associated with the riparian-wetland type that represents just the wet meadow situation.
2. Habitat ranking value for species associated with the riparian-wetland type that represents just the dirt bank situation.

APPENDIX A



Vertebrate
Species
of
Southeaster
Utah

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APPENDIX A

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, 58 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 of 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 west; 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 phylogenetic 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 their 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
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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Leatherside Chub (<u>Gila copiei</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
* Longnose Dace (<u>Rhinichthys cataractae</u>)	A	K-P	Unknown	Pools and riffles
Speckled Dace (<u>Rhinichthys 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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
Family Poeciliidae				
Mosquito fish <u>(Gambusia 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				
* Striped 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Largemouth Bass <u>(Micropterus salmoides)</u>	A,B,C,D,E,F	C-P	Stable	Rivers-quiet water areas; lakes-littoral rocky 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 bottoms
Amphibians -- 11 species in southeastern Utah				
Family Ambystomatidae				
* Tiger Salamander (<u>Ambystoma tigrinum</u>)	A,B,C,D,E,F	K-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 <u>(Scaphiopus intermontanus)</u>	A,B,C,D,E,F	C-P	Unknown	Sagebrush flats, pinion- juniper woodlands to high elevations in spruce-fir communities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Spadefoot Toad <u>(Scaphiopus hammondi)</u>	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 <u>(Bufo boreas)</u>	A	K-P	Unknown	Desert streams, springs, grasslands, woodlands, and mountain meadows
! Red Spotted Toad <u>(Bufo punctatus)</u>	D,E,F,	C-P	Unknown	Open grassland and rocky canyons
! 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>(Pseudacris triseriata)</u>	A,B,C,D,F	C-P	Unknown	Grassy pools, lakes, and marshes of prairies or mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 catesbeiana</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				
*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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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.
! 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Xantusiidae * Utah Night Lizard (<u>Xantusia vigilis</u>)	E,F	L-P	Unknown	Dead clumps of yucca plants and woodrat middens
Family Teiidae Plateau Whiptail (<u>Cnemidophorus velox</u>)	F	K-P	Unknown	Mountains in pinon-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 Scincidae 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

10

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Colubridae Smooth Green Snake <u>(Ophiodrys vernalis)</u>	F	K-P	Unknown	Damp grassy environment
! Striped Whipsnake <u>(Masticophis taeniatus)</u>	A,B,C,D,E,F	C-P	Unknown	Brushlands, grasslands, sagebrush flats, pinion-juniper woodlands and open pine forests
Coachwhip <u>(Masticophis flagellum)</u>	E,F	K-P	Unknown	Utilizes a variety of habitats but avoids dense vegetation; rodent burrows, rocks and branches are used
II ! Racer <u>(Coluber constrictor)</u>	A,B,C,D,E,F	C-P	Unknown	Meadows, sparse brush and forest openings with semi-arid and moist areas; grassy places near rocks and logs are preferred
Corn Snake <u>(Elaphe guttata)</u>	F	K-P	Unknown	Stream and river bottoms, rocky wooded hillsides, coniferous forests, and farmland with rodent burrows, rocks and logs
Ringneck Snake <u>(Diadophis punctatus)</u>	A	K-P	Unknown	Moist habitats usually in the mountains or along stream and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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
! 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 grasslands, woodlands and forests; avoids sparsely vegetated deserts
! Midget Faded Rattlesnake <u>(Crotalus viridis concolor)</u>	A,B,C,D,E,F	C-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Birds -- 278 species in southeastern Utah				
Order Gaviliformes				
Family Gavliidae				
Common Loon (<u>Gavia immer</u>)	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 (<u>Podiceps auritus</u>)	A,B,C,D,E,F	R-P transient and summer resident	Stable	Lakes, ponds and reservoirs
Eared Grebe (<u>Podiceps nigricollis</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, bays and reservoirs
14 * Western Grebe (<u>Acchmophorus occidentalis</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Sloughs, bays and reservoirs and lakes with emergent vegetation for nesting
Pied-billed Grebe (<u>Podilymbus podiceps</u>)	A,B,C,D,E,F	C-P summer resident	Stable	Ponds, lakes, streams and marshes
Order Pelecaniformes				
Family Pelecanidae				
* White Pelican (<u>Pelecanus erythrorhynchos</u>)	A,B,C,D,E,F	L-P transient and summer resident	Stable	Larger shallow bodies of water and large rivers
Family Phalacrocoracidae				
* Double-crested Cormorant (<u>Phalacrocorax auritus</u>)	A,B,C,D,E,F	K-P summer resident	Unknown	Bays, lakes and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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
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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 grainfields
* 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, reservoir, ponds and bays
* 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 reservoir extending from lowlands 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! *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 transient	Stable	Marshes, irrigated land, ponds, lakes and bays
17 * 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	Wooded rivers and ponds
*Redhead (<u>Aythya americana</u>)	A,B,C,D,E,F	C-P resident 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, wooded ponds, marshes and reservoirs
*Canvasback (<u>Aythya valisineria</u>)	A,B,C,D,E,F	C-P transient R-P summer resident	Stable	Marshes, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* 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
* 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 jamaicensis</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	Wooded 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 and ponds
* Red-breasted Merganser (<u>Mergus serrator</u>)	A,B,C,D,E,F	C-P transient	Stable	Lakes, reservoirs and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 trees, posts, carrion or on ground
California Condor (<u>Gymnogyps californianus</u>)	A,B,C,D,E,F	X-P	Extirpated	Usually seen in sky or perched on dead trees, 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, woodlands, mountains and deserts
*Red-shouldered Hawk (<u>Buteo lineatus</u>)	C,F	A-P transient	Unknown	Broken woodlands, primarily along lowland rivers and often close to cultivated fields
! *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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * Rough-legged Hawk (<u>Buteo lagopus</u>)	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; infrequently marshes and 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
20 ! * 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 (<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 foothills; often associated with flocking passerines

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * 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 Galliformes 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 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	Decreasing	

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* 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 wood- lands or mountain brush
Order Gruiformes Family Gruidae * Sandhill Crane <u>(Grus 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, lakes 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * Snowy Plover <u>(Charadrius alexandrinus)</u>	A, B, C, D, E, F	K-P transient	Unknown	Alkali and sand flats
! 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
23 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
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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 alkal mudflats
Western Sandpiper <u>(Calidris mauri)</u>	A, B, C, D, E, F	C-P transient	Stable	Shores, beaches, mud- flats and open marshes
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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 lakes
Family Phalaropodidae Wilson's Phalarope (<u>Phalaropus tricolor</u>)	A, B, C, D, E, F	C-P summer resident and transient	Stable	Shallow lakes, marshes, pools, shores and 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 marshlands 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, farmlands 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

Species	Biogeographic Area	Status	Population Trend	Habitat Use Area
Franklin's Gull (<u>Larus pipixcan</u>)	A, B, C, D, E.	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
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 (<u>Columba fasciata</u>)	A, E, F	U-P summer resident and transient	Stable	Forests, canyons and foothills near mountain brush (acorns) and agricultural lands
! Rock Dove (<u>Columba livia</u>)	A, B, C, D, E, F	C-N resident	Stable	Cities, farms and cliffs
! * Mourning Dove (<u>Zenaida macroura</u>)	A, B, C, D, E, F	C-P summer resident and transient	Stable	Farmlands, towns, open woods, grassland and deserts
White-winged Dove (<u>Zenaidura asiatica</u>)	E, F	A-P summer resident and transient	Unknown	Open woods and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Cuculiformes Family Cuculidae * Yellow-billed Cuckoo <u>(Coccyzus americanus)</u>	A, B, C, D, E, F	K-P summer resident	Unknown	River thickets and willows
Order Strigiformes Family Tytonidae !* Barn Owl (<u>Tyto alba</u>)	A, B, C, D, E, F	K-P resident	Unknown	Woodlands, fields, farms, towns, canyons, cliffs and dirt banks
Family Strigidae * Screech Owl (<u>Otus asio</u>)	A, B, C, D, E, F	U-P resident	Stable	Riparian communities and wooded canyons
* Flammulated Owl (<u>Otus flammeolus</u>)	A, B, C, D, E, F	K-P summer resident	Unknown	Open pine and fir forests in mountains
!* Great Horned Owl (<u>Bubo virginianus</u>)	A, B, C, D, E, F	C-P resident	Stable	Ubiquitous
* Pygmy Owl (<u>Glaucidium gnoma</u>)	A, B, C, D, E, F	K-P resident	Unknown	Wooded canyons in open coniferous, mixed woodlands and pinion-juniper forests
!* Burrowing Owl (<u>Speotyto cunicularia</u>)	A, B, C, D, E, F	L-P resident	Declining	Open grassland, prairies, dikes, desert, farms and prairie dog colonies

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Spotted Owl (<u>Strix occidentalis</u>)	C,E	L-P Unknown	Unknown	Wooded canyons with narrow side canyons in the desert
* 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 side or top
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 at roadsides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Apodiformes				
Family Apodidae				
*Black Swift (<u>Cypseloides niger</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Open areas in mountain country
White-throated Swift (<u>Aeronautes saxatilis</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
29 ! 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>Eugenes fulgens</u>)	E,F	U-P summer resident	Unknown	High mountain forest openings, pine-oak forests and canyons

	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Coraciiformes Family Alcedinidae * Belted Kingfisher <u>(Megasceryle alcyon)</u>	A, B, C, D, E, F	K-P resident	Unknown	Rivers, ponds and lakes
Order Piciformes Family Picidae ! Common Flicker <u>(Colaptes auratus)</u>	A, B, C, D, E, F	C-P resident	Stable	Deciduous or mixed woodlands, open forest, farms towns, canyons and semi-open country
* Pileated Woodpecker <u>(Dryocopus pileatus)</u>	F	K-P resident	Unknown	Mature coniferous and mixed forests with many snags
30 Red-headed Woodpecker <u>(Melanerpes erythrocephalus)</u>	B	R-P resident	Unknown	Groves, farm country, riparian areas, towns and scattered trees
Yellow-bellied Sapsucker <u>(Sphyrapicus varius)</u>	A, B, C, D, E, F	C-P resident	Unknown	In summer woodlands and aspen groves; in winter orchards and other trees
* Williamson's Sapsucker <u>(Sphyrapicus thyroideus)</u>	F	U-P summer resident	Unknown	Higher coniferous forests and burns
* Lewis Woodpecker <u>(Asyndesmus lewis)</u>	F	K-P summer resident and transient	Unknown	Scattered or logged forests, burns, cottonwood 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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
! 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, farmyards and towns with cliffs near water
! Say's Phoebe <u>(Sayornis saya)</u>	A,B,C,D,E,F	C-P resident	Unknown	Open arid country, deserts, bushy plains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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,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 piñon-juniper woodlands
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>(Contopus sordidulus)</u>	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands, pine-oak forests, open conifers and river groves
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 are varied; usually seen on tip of dead tree or branch

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 meadows, 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; when nesting requires dead trees and snags, preferably near water
! Bank Swallow <u>(Riparia riparia)</u>	A,B,C,D,E,F	C-P summer resident	Unknown	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 rustica)</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

Biogeographic Area Inhabited

Status

Population Trend

Habitat Use Area

! Cliff Swallow
(Petrochelidon pyrrhonota)

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 (Progne subis)

A,B,C,E,F

K-P
summer resident

Unknown

Open forests of aspen and conifers

Family Corvidae

Steller's Jay (Cyanocitta stelleri)

A,B,C,D,E,F

C-P
resident

Unknown

Conifers and pine-oak forests

Gray Jay (Perisoreus canadensis)

A,B,C,E,F

R-P
resident

Unknown

Coniferous forests

Scrub Jay (Apelocoma coerulescens)

A,B,C,D,E,F

C-P
resident

Unknown

Foothills, oaks, mountain brush, river woods and pinon-juniper woodlands

] Black-billed Magpie (Pica pica)

A,B,C,D,E,F

C-P
resident

Unknown

Foothills, ranches, sagebrush, river thickets, shelterbelts and prairie brush

! Common Raven (Corvus corax)

A,B,C,D,E,F

C-P
resident

Unknown

Mountains, deserts, canyons and cliffs

! Common Crow (Corvus brachyrhynchos)

A,B,C,D,E,F

O-P
transient

Unknown

Deciduous, mixed and open coniferous woodlands farmlands and river grove

! Pinion Jay (Gymnorhinus cyanocephala)

A,B,C,D,E,F

C-P
resident

Unknown

Pinion-juniper woodlands, but ranges into sagebrush

Clark's Nutcracker
(Nucifraga columbiana)

A,B,C,E,F

C-P
resident

Unknown

High mountains in conifer: near tree line

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 gambeli)</u>	A,B,C,D,E,F	C-P resident	Unknown	In summer mountain forests and conifers; in winter riparian woodlands at lower elevations
Plain Titmouse <u>(Parus inornatus)</u>	A,B,C,D,E,F	K-P resident	Unknown	Pinion-juniper woodlands
Bushtit (<u>Psaltriparus minimus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Oak woodlands, mountain brush, broad-leaved 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 woodlands, 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Certhidae 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
Family Cinclidae 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
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 streamside
Gray Catbird (<u>Dumetella carolinensis</u>)	A,B,C,D,E,F	U-P summer resident	Unknown	Undergrowth, brush or thickets along valley streams

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 towns, lawns, farmland, open forests, streamsides and any wooded habitat; in winter berry-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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
1* Western Bluebird <u>(Sialia mexicana)</u>	A,B,C,D,E,F	K-P summer resident	Unknown	Scattered trees, open conifers, forests and farms
1* Mountain Bluebird <u>(Sialia currucoides)</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
38 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 slopes and junipers
Family Sylviidae Blue-gray Gnatcatcher <u>(Polioptila caerulea)</u>	A,B,C,D,E,F	C-P summer resident	Unknown	Open mixed woods, streamside thickets, mountain brush and pinion-juniper woodlands
Golden-crowned Kinglet <u>(Regulus satrapa)</u>	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 <u>(Regulus calendula)</u>	A,B,C,D,E,F	C-P resident	Unknown	In summer coniferous forests; in winter other woodlands and thickets

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Motacillidae ! Water Pipet (<u>Anthus spinoletta</u>)	A, B, C, D, E, F	C-P resident	Unknown	In summer alpine zone; in migration and winter plains, bare fields, shores and irrigated fields
Family Bombycillidae Bohemian Waxwing (<u>Bombycilla garrulus</u>)	A, B, C, D, E, F	U-P winter resident	Unknown	Widespread and feeds on berries
Cedar Waxwing (<u>Bombycilla cedrorum</u>)	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 (<u>Lanius excubitor</u>)	A, B, C, D, E, F	U-P winter resident	Unknown	Semi-open country or 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>Stuirnus 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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 Warbler (<u>Vermivora ruficapilla</u>)	A,B,C,D,E,F	U-P transient	Unknown	Open mixed woods with undergrowth and at forest edges
40 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>Dendroica petechia</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Willows, aspens, streamside trees and shrubs or town shade trees
* Grace's Warbler (<u>Dendroica graciae</u>)	E,F	U-P summer resident	Unknown	Ponderosa pine-oakbrush communities of the mountains
Magnolia Warbler (<u>Dendroica magnolia</u>)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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>(Dendroica 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
Townsend's Warbler <u>(Dendroica townsendi)</u>	A, B, C, D, E, F	U-P transient	Unknown	Coniferous forests
Northern Waterthrush <u>(Seiurus noveboracensis)</u>	B, C, D, E, F	U-P transient	Unknown	Swampy or wet woods, streamsides and lake-shores; in migration thickets
MacGillivray's Warbler <u>(Oporornis tolmiei)</u>	A, B, C, D, E, F	C-P summer resident	Unknown	Low dense undergrowth and shady, damp thickets
Yellowthroat <u>(Geothlypis trichas)</u>	A, B, C, D, E, F	L-P summer resident	Unknown	Cattail and bulrush marshes, willow thickets and streamsides
Yellow-breasted Chat <u>(Icteria virens)</u>	A, B, C, D, E, F	C-P summer resident	Unknown	Dense brush along

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Wilson's Warbler (<u>Wilsonia pusilla</u>)	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 (<u>Setophaga ruticilla</u>)	A,B,C	U-P transient	Unknown	Open secondary deciduous woodlands and riparian woodlands
Family Ploceidae ! House Sparrow (<u>Passer domesticus</u>)	A,B,C,D,E,F	C-P resident	Unknown	Cities, farms and houses
42 Family Icteridae ! Western Meadowlark (<u>Sturnella neglecta</u>)	A,B,C,D,E,F	C-P resident	Unknown	Open fields, meadows and plains
Yellow-headed Blackbird (<u>Xanthocephalus xanthocephalus</u>)	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 (<u>Agelaius phoeniceus</u>)	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 (<u>Icterus galbula</u>)	A,B,C,D,E,F	C-P summer resident	Unknown	Open woodlands, cottonwoods or other shade trees and riparian areas

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Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Scotts Oriole <u>(Icterus parisorum)</u>	C, D, E, F	U-P summer resident	Unknown	Pinion-juniper woodlands of desert mountains oak slopes and cottonwood trees in canyons
Rusty Blackbird <u>(Euphagus carolinus)</u>	A	O-P transient	Unknown	Wooded marshes and riparian woodlands
! Brewer's Blackbird <u>(Euphagus cyanocephalus)</u>	A, B, C, D, E, F	C-P resident	Unknown	Varied open country, lakeshores, irrigated pastures, feed lots, parks and cities
Common Grackle <u>(Quiscalus quiscula)</u>	A, B, D	A-P transient	Unknown	Farms, fields, stream-sides and wet woodlands
! Brown-headed Cowbird <u>(Molothrus ater)</u>	A, B, C, D, E, F	C-P resident	Unknown	Farms, fields, barnyards wood edges and riparian woodlands
Family Thraupidae Western Tanager <u>(Piranga ludoviciana)</u>	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 <u>(Phoebastria ludoviciana)</u>	F	O-P summer resident	Unknown	Broadleaf riparian areas and aspens
Black-headed Grosbeak <u>(Phoebastria melanocephalus)</u>	A, B, C, D, E, F	C-P summer resident	Unknown	Edges of second growth deciduous woods, pinion, riparian areas, orchards

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Blue Grosbeak (<u>Guiraca caerulea</u>)	B, C, D, E, F	C-P summer resident	Unknown	Brushy and weedy places, willows and river thickets and other riparian areas
! Lapland Longspur (<u>Calcarius lapponicus</u>)	A, B, C, D, E, F	R-P winter resident	Unknown	Fields, grasslands, saline flats, desert shrub; often seen with horned larks
! Indigo Bunting (<u>Passerina cyanea</u>)	A, B, D	R-P summer resident	Unknown	Brush, farm lands and streamsides
Lazuli Bunting (<u>Passerina amoena</u>)	A, B, C, D, E, F	C-P summer resident	Unknown	Mountain brush, stream-side shrubs and farmland tree rows
77 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
Rufous-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 melanocorys</u>)	A, B, C, D, E, F	O-P transient	Unknown	Plains, prairies, desert shrub and sagebrush
! Savannah Sparrow (<u>Passerculus sandwichensis</u>)	A, B, C, D, E, F	C-P summer resident	Unknown	Grasslands, fields, saltgrass meadows and open country
! * Grasshopper Sparrow (<u>Ammodramus sayannarum</u>)	A, B, C, D, E, F	K-P transient	Unknown	Dry grasslands
LeConte's Sparrow (<u>Ammospiza leconteii</u>)	F	A-P transient	Unknown	Tall grass, weedy meadows and marshes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Vesper Sparrow <u>(Poocetes gramineus)</u>	A, B, C, D, E, F	C-P summer resident	Unknown	Alfalfa and grain fields, meadows, sagebrush and desert shrub
! 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-eyed 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
45 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 arborca</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

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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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 47 <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, D, E, F	C-P resident	Unknown	Coniferous forests, along edges of second growth deciduous forests; in migration seen in large flocks in the lower valle

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! American Goldfinch <u>(Carduelis tristis)</u>	A, B, C, D, E, F	C-P resident	Unknown	Riparian woodlands, willows, cottonwoods, orchards, roadsides and sunflowers
Lesser Goldfinch <u>(Carduelis psaltria)</u>	A, B, C, D, E, F	C-P resident	Unknown	Open brushy country, open woods, wooded streams and gardens
Red Crossbill <u>(Loxia curvirostra)</u>	A, B, C, E, F	U-P summer resident	Unknown	Coniferous forests
Mammals -- 103 species in southeastern Utah				
Order Insectivora				
Family Soricidae				
87 !* Dwarf Shrew (<u>Sorex nanus</u>)	B, C, D, E, F	L-N	Unknown	Open grass-covered areas which may have scattered brush, marshes, coniferous forests and openings in woods
North Water Shrew <u>(Sorex palustris)</u>	A, B, C, E, F	C-N	Unknown	Along nearly all permanent streams in mountainous areas
! Merriam Shrew (<u>Sorex merriami</u>)	A, B, C, D, E, F	U-N	Unknown	Arid sagebrush or grassland areas, mountain mahogany, coniferous forests, aspen and cottonwoods
Vagrant Shrew (<u>Sorex vagrans</u>)	A, B, C, F	C-N	Unknown	Marshes, bogs, wet meadows and along streams in forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
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				
67 } Little Brown Myotis (<u>Myotis lucifugus</u>)	A, B, C, D, E, F	C-N	Unknown	Caves, mine tunnels, hollow trees or buildings usually near water
! Fringed Myotis (<u>Myotis thysanodes</u>)	A, B, C, D, E, F	U-N	Unknown	Caves, old buildings, rock crevices, pinion-juniper and desert shrub
Long-eared Myotis (<u>Myotis evotis</u>)	A, B, C, D, E, F	C-N	Unknown	Coniferous forests in high mountains, around buildings or trees and occasionally caves
! Long-legged Myotis (<u>Myotis volans</u>)	A, B, C, D, E, F	C-N	Unknown	Buildings, small pockets, crevices in rock ledges and trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Yuma Myotis (<u>Myotis yumanensis</u>)	A,B,C,D,E,F	U-N	Unknown	Caves, tunnels and buildings in arid areas
! California Myotis (<u>Myotis californicus</u>)	A,B,C,D,E,F	C-N	Unknown	Mine tunnels, hollow 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 in rocks and in 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	I-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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Mexican Big-eared Bat <u>(Plecotus 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-N	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>(Ochotona princeps)</u>	A, B, C, E, F	C-N	Unknown	Talus slopes and rock-slides above 8,000 feet elevation
Family Leporidae				
! White-tailed Jackrabbit <u>(Lepus townsendii)</u>	A, B, C, D	C-N	Stable	Open, grassy or sagebrush areas at medium elevation
* Snowshoe Hare <u>(Lepus americanus)</u>	A, B, C	L-P	Cyclic	Coniferous forests and aspen, riparian and brush types near conifers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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				
52 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*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
Utah 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
53 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-billed 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 (<u>Glaucomys sabrinus</u>)	A, B, C, F	K-N	Unknown	Coniferous and mixed forests in high mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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
54 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! 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 preferred but found on hard soils
Baird Pocket Mouse (<u>Perognathus flavus</u>)	F	C-N	Unknown	Prefers short grass areas with sandy or rocky soils
! Great Basin Pocket Mouse (<u>Perognathus parvus</u>)	A,D	C-N	Unknown	Sagebrush or greasewood and other desert shrub communities and pinion-juniper
5 Apache Pocket Mouse (<u>Perognathus apache</u>)	C,D,F	C-N	Unknown	Sparse brushlands and scattered pinion-juniper, usually 5,000-7,200 feet elevation
Family Castoridae * Beaver (<u>Castor canadensis</u>)	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 (<u>Reithrodontomys megalotis</u>)	A,B,C,D,E,F	C-N	Unknown	Grasslands, open desert, wetlands, irrigated farmland of dense vegetation near water
Canyon Mouse (<u>Peromyscus crinitus</u>)	A,B,C,D,E,F	C-N	Unknown	Rocky canyons and slopes with mountain brush

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Deer Mouse ! <u>(Peromyscus maniculatus)</u>	A, B, C, D, E, F	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
5 *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
Bushy-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 canals

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Meadow Vole <u>(Microtus pennsylvanicus)</u>	A, D	C-N	Unknown	Moist areas 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 in mountains to above timberline
! 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Zapodidae Western Jumping Mouse <u>(Zapus princeps)</u>	A	C-N	Unknown	Low meadows near streams with lush growth of grasses and forbs; found in various land habitats
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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*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 cliffs
Family Mustelidae				
*Short-tailed Weasel (<u>Mustela erminea</u>)	A, B, C, F	K-P	Unknown	Brushy or wooded areas not far from water
! *Long-tailed Weasel (<u>Mustela srenata</u>)	A, B, C, D, E, F	C-P	Stable	All land habitat types near water
*Mink (<u>Mustela vison</u>)	A, B, C, F	L-P	Unknown	Along streams and lakes
*Wolverine (<u>Gulo luscus</u>)	A, B	L-P	Unknown	Remote mountain regions
! *Black-footed Ferret (<u>Mustela nigripes</u>)	A, B, C, D, F	E-P	Unknown	Prairie dog towns
*Marten (<u>Martes caurina</u>)	A, B, C, F	R-P	Unknown	Coniferous forests at high elevations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * Badger (<u>Taxidea taxus</u>)	A, B, C, D, E, F	C-P	Stable	Open grasslands, deserts and high mountain forests where prey is available
! * Striped Skunk (<u>Mephitis mephitis</u>)	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 (<u>Spilogale gracilis</u>)	A, B, C, D, E, F	C-P	Stable	Prairies or grasslands with brushy or sparsely wooded areas along streams with boulders
♂ * River Otter (<u>Lutra canadensis</u>)	A, B, C, D, E, F	L-P	Unknown	Along streams and lake borders
Family Felidae * Bobcat (<u>Lynx rufus</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>Odocoileus 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

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* 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
19 Family Bovidae * Desert Bighorn Sheep (<u>Ovis canadensis nelsoni</u>)	D, E, F	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
* Rocky Mountain Bighorn 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

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			
Cougar	x	x	x	x	x
Desert Bighorn Sheep	x	x	x	x	x
Elk	x	x			
Moose	x	x	x	x	x
Mountain Bighorn Sheep	x		x	x	x
Mountain Goat			x	x	x
Mule Deer			x		
Pronghorn Antelope	x	x	x	x	x
Subtotal	X 9	X 7	X 8	X 7	X 7

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20 GAME FISH SPECIES

Arctic Grayling		x			
Black Bullhead	x	x		x	x
Black Crappie	x	x	x	x	x
Bluegill	x	x	x	x	x
Bonneville Cisco		x	x	x	x
Brook Trout	x				x
Brown Trout	x	x	x	x	x
Channel Catfish	x	x	x	x	x
Cutthroat Trout	x	x	x	x	x
Golden Trout		x	x	x	x
Kokanee Salmon			x	x	
Lake Trout				x	x
Largemouth Bass		x	x	x	x
Mountain Whitefish	x	x	x	x	x
Northern Pike	x	x	x	x	x
Perch	x	x			
Rainbow & Albino Trout	x	x	x	x	x
Smallmouth Bass		x	x	x	x
Striped Bass			x	x	x
Walleye	x	x			
White Bass		x	x	x	x
Subtotal	X 13	X 16	X 16	X 17	X 17

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern

9 FURBEARER SPECIES

Badger					
Beaver	x				
Long-tailed Weasel	x		x		x
Marten	x		x		x
Mink	x		x		x
River Otter	x		x		x
Short-tailed weasel	x		x		x
Spotted Skunk	x		x		x
Striped Skunk	x		x		x
Subtotal	<u>x</u> 9	<u>x</u> 8	<u>x</u> 8	<u>x</u> 9	<u>x</u> 9

43 MIGRATORY GAME BIRD SPECIES

American Widgeon					
Band-tailed Pigeon	x		x		
Barrows Goldeneye	x		x		x
Black Brant	x		x		
Black Duck				x	x
Blue-winged Teal			x		x
Bufflehead	x		x		x
Canada Goose	x		x		x
Canvasback	x		x		x
Cinnamon Teal	x		x		x
American Coot	x		x		x
Common Gallinule	x		x		x
Common Goldeneye	x		x		x
Common Merganser	x		x		x
Common Snipe	x		x		x
European Widgeon			x		x
Fulvous Tree Duck			x		x
Gadwall					x
Greater Scaup	x		x		x
Green-winged Teal	x		x		x
Harlequin Duck	x		x		x
					x

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
Hooded Merganser	x	x	x	x	x
Lesser Scaup	x	x	x	x	x
Mallard	x	x	x	x	x
Mourning Dove	x	x	x	x	x
Old Squaw		x	x	x	x
Pintail	x	x	x		x
Red-breasted Merganser	x	x	x	x	x
Redhead	x	x	x	x	x
Ring-necked Duck	x	x	x	x	x
Ross Goose	x	x	x	x	x
Ruddy Duck	x	x	x		x
Sandhill Crane	x	x	x	x	x
Shoveler	x	x	x	x	x
Snow Goose	x	x	x	x	x
Sora Rail	x	x	x	x	x
Surf Scoter			x	x	x
Trumpeter Swan			x		x
Virginia Rail	x	x	x		x
Whistling Swan	x	x	x	x	x
White-fronted Goose	x	x	x	x	x
White-winged Scoter	x	x	x		x
Wood Duck	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				
Mountain cottontail	x	x	x	x	
Pigmy Cottontail		x	x		x
Snowshoe Hare	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>
Subtotal	4	4	4	3	3

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
12 SMALL GAME-UPLAND BIRD SPECIES					
Blue Grouse	x				
California Quail	x	x	x	x	x
Chukar	x	x	x	x	x
Gambels Quail	x	x	x	x	x
Hungarian Partridge		x			
Merriam's Turkey	x'		x		x
Ring-necked Pheasant	x	x			
Ruffed Grouse	x	x	x	x	x
Sage Grouse	x	x	x	x	x
Sharp-tailed Grouse		x	x	x	x
White-tailed Ptarmigan					x
White-winged Pheasant				x	x
Subtotal	<u>x</u> 9	<u>x</u> 9	<u>7</u>	<u>7</u>	<u>9</u>
<hr/>					
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	(0)	(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)
Protected-Game	(18)	(19)	(19)	(12)	(16)	(19)
Unprotected-Extirpated	(0)	(0)	(0)	(0)	(0)	(0)
Unprotected-Nongame	(63)	(58)	(58)	(52)	(53)	(62)
Total Protected Species	277	286	279	263	293	317
TOTAL:	364	363	358	336	369	421

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

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

Class of Animal	Number of species		
	Statewide ¹	SER ²	Soldier Creek Mine Banning Loadout
Fish	33	20	0
Amphibians	3	2	0
Reptiles	10	4	0
Birds	104	95	25
Mammals	61	40	13
TOTAL	211	161	38

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 state's high interest wildlife inhabit the Southeastern Region (SER) of the state on occasion or during different seasons of the year.

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APPENDIX B

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

<u>Common Name</u>	<u>Botanical Name</u>
Cinquefoil, bush	Potentilla fruticosa
Cliffrose, Stansbury	Cowania mexicana stansburiana
Clover, alsike	Trifolium hybridum
Clover, strawberry	T. fragiferum
Collomia, slenderleaf	Collomia linearis
Columbine, Colorado	Aquilegia coerulea
Cotoneaster, Peking	Cotoneaster acutifolia
Cowparsnip, common	Heracleum lanatum
Creosotebush, spreading	Larrea divaricata
Crownvetch, coronilla	Coronilla varia
Currant, golden	Ribes aureum
Currant, gooseberry	R. montigenum
Currant, squaw	R. cereum inebrians
Currant, sticky	R. viscosissimum viscosissimum
Cypress, Arizona	Cupressus arizonica
Cypress, Belvedere summer	Kochia scoparia
Daisy, common oxeye	Chrysanthemum leucanthemum
Dandelion, common	Taraxacum officinale
Deathcamas	Zigadenus spp.
Dogwood, redosier	Cornus stolonifera stolonifera
Douglas-fir	Pseudotsuga menziesii menziesii
Dropseed, sand	Sporobolus cryptandrus
Dropseed, spike	S. contractus
Elder, blueberry	Sambucus cerulea
Elder, redberry	S. racemosa pubens microbotrys
Ephedra, green	Ephedra viridis
Ephedra, Nevada	E. nevadensis
Eriogonum, cushion	Eriogonum ovalifolium
Eriogonum, Wyeth	E. heracleoides

<u>Common Name</u>	<u>Botanical Name</u>
Fescue, hard sheep	Festuca ovina duriscula
Fescue, reed (alta or tall)	F. arundinacea
Fescue, sulcata sheep	F. sulcata
Fescue, Thurber	F. thurberi
Fir, subalpine	Abies lasiocarpa
Fir, white	A. concolor
Flax, Lewis (or blue)	Linum lewissi
Fleabane, Oregon	Eriogonum speciosus macranthus
Forestiera, New Mexican	Forestiera neomexicana
Forestiera, New Mexican olive	F. phillyneoides
Foxtail, barley	Hordeum jubatum jubatum
Foxtail, meadow	Alopecurus pratensis
Foxtail, reed	A. arundinaceus
Galleta	Hilaria jamesii
Geranium, sticky	Geranium viscosissimum
Giant hyssop, nettleleaf	Agastache urticifolia glaucifolia
Globemallow, gooseberry leaf	Sphaeralcea grossulariaefolia
Globemallow, stream	S. rivularis
Goldeneye, Nevada showy	Vigulera multiflora nevadensis
Goldeneye, Canada	Solidago canadensis
Goldenrod, low	S. multiradiata
Goldenrod, Parry	S. parryi
Goosefoot	Chenopodium spp.
Greasewood, black	Sarcobatus vermiculatus vermiculatus
Goldeneye, showy	Vigulera multiflora

<u>Common Name</u>	<u>Botanical Name</u>
Groundsel, butterwood	<i>Senecio serpa</i>
Hair-grass, tufted	<i>Deschampsia caespitosa</i>
Halogeton	<i>Halogeton glomeratus</i>
Hawthorn, river	<i>Crataegus douglasii rivularis</i>
Helianthella, oneflower	<i>Helianthella uniflora</i>
Honeylocust, common	<i>Gleditsia triacanthos</i>
Honeysuckle, bearberry	<i>Lonicera involucrata</i>
Honeysuckle, Tatarian	<i>L. tatarica</i>
Hopsage, spineless	<i>Grayia brandegei</i>
Hopsage, spiny	<i>G. spinosa</i>
Iodine bush	<i>Allenrolfea occidentalis</i>
Iris, German (common iris)	<i>Iris germanica</i>
Ivesia, Gordon	<i>Ivesia gordonii</i>
Juniper, Rocky Mountain	<i>Juniperus scopulorum</i>
Juniper, Utah	<i>J. osteosperma</i>
Knotweed, Douglas	<i>Polygonum douglasii douglasii</i>
Larkspur	<i>Delphinium spp.</i>
Leptotaenia, carrotleaf	<i>Lomatium dissectum</i>
Lettuce, prickly	<i>Lactuca serriola</i>
Ligusticum, Porter	<i>Ligusticum porteri</i>
Lilac, common	<i>Syringa vulgaris</i>
Lilac, late	<i>S. villosa</i>
Locust, black	<i>Robinia pseudoacacia</i>
Lomatium, nineleaf	<i>Lomatium triternatum</i>
Lomatium, Nuttall	<i>L. nuttallii</i>
Lupine, mountain	<i>Lupinus alpestris</i>
Lupine, Nevada	<i>L. nevadensis</i>

<u>Common Name</u>	<u>Botanical Name</u>
Lupine, silky	<i>L. sericeus</i>
Lupine, silvery	<i>L. argenteus</i>
Maple, bigtooth	<i>Acer grandidentatum</i>
Maple, Manchurian	<i>A. mandshuricum</i>
Maple, Rocky Mountain	<i>A. glabrum</i>
Matrimony-vine	<i>Lycium halimifolium</i>
Medick black	<i>Medicago lupulina</i>
Mesquite	<i>Prosopis spp.</i>
Milkvetch, chickpea	<i>Astragalus cicer</i>
Milkvetch, sicklepod	<i>A. falcatus</i>
Milkvetch, Snakeriver plains	<i>A. filipes</i>
Milkvetch, tall	<i>A. galegiformis</i>
Mountain-mahogany, curlleaf	<i>Cercocarpus ledifolius ledifolius</i>
Mountain-mahogany, littleleaf	<i>C. ledifolius intricatus</i>
Mountain-mahogany, true or birchleaf	<i>C. montanus montanus</i>
Muhly, mat	<i>Muhlenbergia richardsonis</i>
Mustard, African	<i>Malcolmia africana</i>
Needlegrass, green	<i>Stipa viridula</i>
Needlegrass, Letterman	<i>S. lettermani</i>
Oak, Gambel (shrubby)	<i>Quercus gambelii</i>
Oatgrass, tall	<i>Arrhenatherum elatius</i>
Orchardgrass	<i>Dactylis glomerata</i>

<u>Common Name</u>	<u>Botanical Name</u>
Painted-cup, Northwestern	<i>Castilleja hispida</i>
Peachbrush, desert	<i>Prunus fasciculata</i>
Peashrub, Siberian	<i>Caragana arborescens</i>
Peavine, flat	<i>Lathyrus sylvestris</i>
Peavine, perennial	<i>L. latifolius</i>
Peavine, thickleaf	<i>L. lanszwertii</i>
Peavine, Utah	<i>L. utahensis</i>
Penstemon, Eaton	<i>Penstemon eatonii</i>
Penstemon, littlecup	<i>P. sepalulus</i>
Penstemon, low	<i>P. humilis</i>
Penstemon, Palmer	<i>P. palmeri</i>
Penstemon, Rydberg	<i>P. rydbergii</i>
Penstemon, sidehill	<i>P. platyphyllus</i>
Penstemon, thickleaf	<i>P. pachyphyllus</i>
Penstemon, toadflax	<i>P. linarioides</i>
Penstemon, Wasatch	<i>P. cyananthus</i>
Pine, pinyon	<i>Pinus edulis</i>
Pine, ponderosa	<i>P. ponderosa</i>
Pine, singleleaf pinyon	<i>P. monophylla</i>
Plum, American	<i>Prunus americana</i>
Quackgrass	<i>Agropyron repens</i>
Rabbitbrush, Douglas	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>
Rabbitbrush, dwarf	<i>C. depressus</i>
Rabbitbrush, Parry	<i>C. parryi parryi</i>
Rabbitbrush, rubber	<i>C. nauseosus nauseosus</i>
Rabbitbrush, small	<i>C. stenophyllus</i>
Raspberry, American red	<i>Rubus idaeus sachalinensis</i>
Redtop	<i>Agrostis alba</i>
Reedgrass, chee	<i>Calamagrostis epigeios</i>

<u>Common Name</u>	<u>Botanical Name</u>
Rhubarb, garden	<i>Rheum rhapenticum</i>
Ricegrass, Indian	<i>Oryzopsis hymenoides</i> <i>hymenoides</i>
Rose, Woods	<i>Rosa woodsii</i> <i>ultramontana</i>
Rush, Baltic	<i>Juncus balticus</i>
Russian-olive	<i>Elaeagnus angustifolia</i>
Russianthistle	<i>Salsola kali tenuifolia</i>
Rye, mountain	<i>Secale montanum</i>
Rye, winter	<i>S. cereale</i>
Sacaton, alkali	<i>Sporobolus airoides</i> <i>airoides</i>
Sagebrush, Louisiana	<i>Artemisia ludoviciana</i> <i>ludoviciana</i>
Sagebrush, tarragon	<i>A. dracunculus</i>
Sagebrush, big	<i>A. tridentata tridentata</i>
Sagebrush, black	<i>A. arbuscula nova</i>
Sagebrush, bud	<i>A. spinescens</i>
Sagebrush, fringed	<i>A. frigida</i>
Sagebrush, silver	<i>A. cana cana</i>
Salsify, vegetable-oyster	<i>Tragopogon porrifolius</i>
Saltbush, fourwing	<i>Atriplex canescens</i>
Saltbush, Gardner	<i>A. gardneri</i>
Saltbush, shadscale	<i>A. confertifolia</i>
Saltgrass, inland	<i>Distichlis spicata</i> <i>stricta</i>
Salt-tree, Siberian	<i>Halimodendron</i> <i>halodendron</i>
Sedge, ovalhead	<i>Carex festivella</i>
Seepweed (pickleweed)	<i>Suaeda</i> spp.
Serviceberry, Saskatoon	<i>Amelanchier alnifolia</i>

<u>Common Name</u>	<u>Botanical Name</u>
Serviceberry, Utah	<i>A. utahensis utahensis</i>
Snowberry, longflower	<i>Symphoricarpos longiflorus</i>
Snowberry, mountain	<i>S. oreophilus</i>
Solomon-plume, fat	<i>Smilacina racemosa</i>
	<i>amplexicaulis</i>
Sophora, Arizona	<i>Sophora arizonica</i>
Spruce, Colorado blue	<i>Picea pungens</i>
Spruce, Engelmann	<i>P. engelmannii</i>
Squirreltail, bottlebrush	<i>Sitanion hystrix</i>
Squaw-apple	<i>Peraphyllum ramosissimum</i>
Starwort, tuber	<i>Stellaria jamesiana</i>
Sumac, Rocky Mountain smooth	<i>Rhus glabra cismontana</i>
Sumac, skunk bush	<i>R. trilobata trilobata</i>
Sweetanise	<i>Osmorhiza occidentalis</i>
Sweetclover, white	<i>Melilotus alba</i>
Sweetclover, yellow	<i>M. officinalis</i>
Sweetroot, spreading	<i>Osmorhiza chilensis</i> (<i>divaricata</i>)
Sweetvetch, Utah	<i>Hedysarum boreale</i> <i>utahensis</i>
Tansymustard, flixweed	<i>Descurainia sophia</i>
Tansymustard, pinnate	<i>D. pinnata</i>
Tarweed, cluster	<i>Madia glomerata</i>
Tenella weed	<i>Chorispora tenella</i>
Timothy	<i>Phleum pratense</i>
Tumblemustard	<i>Sisymbrium altissimum</i>
Valerian, edible	<i>Valeriana edulis</i>
Vetch, American	<i>Vicia americana minor</i>
Vetch, bramble	<i>V. tenuifolia</i>

<u>Common Name</u>	<u>Botanical Name</u>
Violet, goosefoot	<i>Viola purpurea</i>
Virginsbower, western	<i>Clematis ligusticifolia</i>
Wheatgrass, bearded	<i>Agropyron subsecundum</i>
Wheatgrass, bearded bluebunch	<i>A. spicatum</i>
Wheatgrass, beardless bluebunch	<i>A. spicatum inerme</i>
Wheatgrass, bluestem	<i>A. smithii</i>
Wheatgrass, crested (Fairway)	<i>A. cristatum</i>
Wheatgrass, crested (Standard)	<i>A. desertorum</i>
Wheatgrass, intermediate	<i>A. intermedium</i>
Wheatgrass, pubescent or stiffhair	<i>A. trichophorum</i>
Wheatgrass, Scribner	<i>A. scribneri</i>
Wheatgrass, Siberian	<i>A. sibiricum</i>
Wheatgrass, slender	<i>A. trachycaulum</i>
Wheatgrass, tall	<i>A. elongatum</i>
Wildrye, blue	<i>Elymus glaucus</i>
Wildrye, Colorado	<i>E. ambiguus ambiguus</i>
Wildrye, creeping	<i>E. triticoides</i>
Wildrye, Great Basin	<i>E. cinereus</i>
Wildrye, mammoth	<i>E. giganteus</i>
Wildrye, Russian	<i>E. junceus</i>
Wildrye, sabulosa	<i>E. sabulosus</i>
Wildrye, Salina	<i>E. salina</i>
Wildrye, yellow	<i>E. flavescens</i>
Willow, Gyer	<i>Salix exigua</i> <i>stenophylla</i>
Willow, purpleosier	<i>S. purpurea purpurea</i>

Common Name

Willow, Scouler
Winterfat, common
Woad, Dyers
Wormwood, oldman
Wyethia, mulesears

Yarrow, western
Yellowbrush

Yucca
Yucca, Joshua-tree

Botanical Name

S. scouleriana
Eurotia lanata lanata
Isatis tinctoria
Artemisia abrotanum
Wyethia amplexicaulis

Achillea millefolium lanulosa
Chrysothamnus viscidiflorus lanceolatus
Yucca spp.
Yucca brevifolia brevifolia

Common Name

Botanical Name

Table 1. Continued

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 virginsbower*

Winterfat*

Wyeth eriogonum

Yellowbrush

 Alternate Species for Mountain Brush Associations

Grasses:

Bearded bluebunch wheatgrass	Great Basin wildrye	Sand dropseed*
Beardless bluebunch wheatgrass	Green needlegrass*	Siberian wheatgrass
Big bluegrass *	Hard sheep fescue	Slender wheatgrass
Bluestem wheatgrass	Indian ricegrass*	Standard crested wheatgrass
Bottlebrush squirreltail *	Kentucky bluegrass*	Sulcata sheep fescue
Bulbous barley*	Meadow brome*	Tall wheatgrass *
Bulbous bluegrass*	Mountain rye *	Winter rye *

Forbs:

American vetch*	Louisiana sagebrush*	Small burnet
Bouncing-bet	Low penstemon*	Stream globemallow*
Bramble vetch*	Nevada showy goldeneye	Sweetanise*
Common cowparsnip*	Nuttall lomatium	Tall milkvetch*
Cutleaf balsamroot	Palmer penstemon*	Tarragon sagebrush*
Eaton penstemon*	Parry goldenrod*	Thickleaf penstemon*
German iris*	Sicklepod milkvetch	Toadflax penstemon*
Gooseberryleaf globemallow*	Sidehill penstemon*	Wasatch penstemon*
Lewis (or blue) flax	Silky lupine*	Cushion eriogonum*

Shrubs:

Apache-plume*	Desert bitterbrush*	Nevada ephedra*
Arizona cypress*	Desert peachbrush*	New Mexican forestiera*
Black common chokecherry*	Dwarf rabbitbrush*	Oldman wormwood (stem cut-
Black sagebrush	Fringed sagebrush*	tings)*
Blueberry elder *	Gambel oak*	Parry rabbitbrush*
Boxelder*	Gardner saltbush*	Peking cotoneaster*
Common bladdersenna*	Longflower snowberry*	Purpleosier willow*
Common lilac*	Martin ceanothus*	Redberry elder*
Creeping barberry*	Mountain snowberry*	Rocky Mountain sumac*

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 -					<u>Pounds</u>
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, 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 hellanthella	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

Species	North exposures and shady areas		Sur 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

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 giant hyssop	Utah peavine
			Northwestern painted-cup	Vegetable-oyster salsify
			Oregon checkermallow	

Table 2 . Continued

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		

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 foxtall	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	Edible valerian
Strawberry clover	2	1	3	1 1/2	aster	Pacific aster
Black medick	2	1	0	0	Pacific aster	
Oregon checkermallow	2	1	0	0		
Totals	19	9 1/2	18	9		

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. 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	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
Strawberry clover	2	1	1	0	strain or Ladak)
Pacific aster	1	1/2	1	1/2	Black medick
					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

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

Tabl.). 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. 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	
	-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
Forbs:			Forbs:
Alfalfa	2	1	Alfileria
Small burnet	3	1 1/2	German Iris
Gooseberryleaf globemallow	1	1/2	Lewis flax
Shrubs:			Shrubs:
Fourwing saltbush	5	2 1/2	Antelope bitterbrush
Winterfat	3	1 1/2	Apache-plume
			Cliffrose
Totals	20	10	Desert bitterbrush
			Desert peachbrush
			Longflower snowberry
			Utah serviceberry

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. 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	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 foxtall	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	

Table 7. Continued

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 eriogonum	
Totals	20	10	18	9		

Table 8. Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed black greasewood 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	Wet to moist soils with high water table.		Dry soils with low water table.		Alternate Species
	Broadcast	Drilled	Broadcast	Drilled	
-Pounds per acre-					
Grasses:					
Tall wheatgrass	3	1 1/2	1	1/2	Grasses:
Fairway crested wheatgrass	1	1/2	3	1 1/2	Alkali sacaton
Pubescent or intermediate wheatgrass	1	1/2	1	1	Creeping wildrye
Reed fescue	2	1	0	0	Bluestem wheatgrass
Russian wildrye	2	1	4	2	Great Basin wildrye
Quackgrass ¹	2	1	2	1	Bottlebrush
					Reed canarygrass
					squirreltail
Forbs:					
Strawberry clover	1	1/2	0	0	
Yellow sweetclover	3	1	2	1	
Shrubs:					
Fourwing saltbush	1	1/2	2	1	Shrubs:
Gardner saltbush	1	1/2	1	1/2	Big sagebrush
Rubber rabbitbrush	1/2	1/4	1	1/2	Russet buffaloberry
Winterfat	0	0	1	1/2	Russian-olive
					Yellowbrush
Totals	17 1/2	8 1/4	18	9 1/2	

¹ Not recommended if site is near agricultural areas onto which it might spread.

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	
Standard crested wheatgrass	2	1	0	0	
Bearded bluebunch wheatgrass	1/2	1/2	1	1/2	
Bluestem wheatgrass	1/2	1/2	1	1/2	
Intermediate wheatgrass	1/2	1/2	1	1	
Pubescent wheatgrass	1/2	1	1	1	
Russian wildrye	1	1	1	1	
Grasses:					
					Alkali sacaton*
					Indian ricegrass
					Bottlebrush squirreltail
					Orchardgrass*
					Bulbous barley*
					Sand dropseed*
					Bulbous bluegrass*
					Siberian wheatgrass
					Great Basin wildrye
					Smooth brome
					Hard sheep fescue*
					(southern strain)*
					Winter rye*
Forbs:					
Alfalfa (Rambler, Nomad or Ladak - equal amount of each)	1	1	1	1	
Utah sweetvetch	0	0	1/2	1/2	
Arrowleaf balsamroot	1/2	1/4	1/2	1/2	
Small burnet	0	0	1/2	1/2	
Forbs:					
					Bouncing-bet*
					Pacific aster*
					Cushion eriogonum*
					Palmer penstemon*
					Cutleaf balsamroot*
					Showy goldeneye*
					Eaton penstemon*
					Silky lupine*
					Goosebeardryleaf globemallow*
					Lewis flax
					Smooth aster*
					Louisiana sagebrush*
					Vegetable-oyster salsify*
					Nevada lupine*
					Nevada showy goldeneye*
					Wasatch penstemon*
					Oneflower helianthella*
					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					Martin ceanothus*
Black sagebrush					Nevada ephedra
Bud sagebrush*					Rocky Mountain smooth sumac*
Desert peachbrush*					Spineless hopsage*
Douglas rabbitbrush					Spiny hopsage*
Gardner saltbush*					Squaw-apple*
Green ephedra					Wyeth eriogonum*
Longflower snowberry*					

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. 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 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	Grasses:
Standard crested wheatgrass	1	1	1	1/2	Bearded or beardless blue-bunch wheatgrass
Bluestem wheatgrass	1	1/2	0	0	Bottlebrush squirreltail
Intermediate wheatgrass	1	1/2	1	1	Bulbous barley
Pubescent wheatgrass	1	1/2	1	1	Bulbous bluegrass
Russian wildrye	1	1/2	1	1/2	Great Basin wildrye
Smooth brome (southern strain)	0	0	1	1	Hard fescue
					Indian ricegrass
					Meadow brome*
					Mountain rye*
					Orchardgrass
					Sheep fescue
					Siberian wheat- grass
					Sulcata sheep fescue
					Tall wheatgrass*
					Winter rye*
Forbs:					
Alfalfa (Rambler, Nomad, Travois, or Ladak - equal amount of each	1	1	2	1	Forbs:
Chickpea milkvetch	0	0	1	1/2	Lewis ^h flax
Utah sweetvetch	1	1/2	1	1/2	Nevada showy goldeneye
Yellow sweetclover	1	1/2	1	1/2	Nuttall lomatium
Arrowleaf balsamroot	1	1/2	1	1/2	Pacific aster
Small burnet	1	1	1	1/2	Showy goldeneye
					Eaton penstemon*
					Gooseberryleaf globe- mallow*
					Louisiana sagebrush*
					Nevada lupine*
					Bouncing-bet*
					Bramble vetch*
					German iris*
					Cutleaf balsamroot*
					Sicklepod milkvetch
					Oneflower
					helianthella *
					Palmer penstemon*
					Parry goldenrod*
					Silky lupine*
					Small aster*
					Tarragon sagebrush*
					Thickleaf penstemon*
					Toadflax penstemon*
					Vegetable-oyster salsify*
					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	Broadcast
-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 sweetclove	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	
Curlleaf 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	Great Basin wildrye	Sand dropseed*
Beardless bluebunch wheatgrass	Green needlegrass*	Siberian wheatgrass
Big bluegrass *	Hard sheep fescue	Slender wheatgrass
Bluestem wheatgrass	Indian ricegrass*	Standard crested wheatgrass
Bottlebrush squirreltail *	Kentucky bluegrass*	Sulcata sheep fescue
Bulbous barley*	Meadow brome*	Tall wheatgrass *
Bulbous bluegrass*	Mountain rye *	Winter rye *

Forbs:

American vetch*	Louisiana sagebrush*	Small burnet
Bouncing-bet	Low penstemon*	Stream globemallow*
Bramble vetch*	Nevada showy goldeneye	Sweetanise*
Common cowparsnip*	Nuttall lomatium	Tall milkvetch*
Cutleaf balsamroot	Palmer penstemon*	Tarragon sagebrush*
Eaton penstemon*	Parry goldenrod*	Thickleaf penstemon*
German iris*	Sicklepod milkvetch	Toadflax penstemon*
Gooseberryleaf globemallow*	Sidehill penstemon*	Wasatch penstemon*
Lewis (or blue) flax	Silky lupine*	Cushion eriogonum*

Shrubs:

Apache-plume*	Desert bitterbrush*	Nevada ephedra*
Arizona cypress*	Desert peachbrush*	New Mexican forestiera*
Black common chokecherry*	Dwarf rabbitbrush*	Oldman wormwood (stem cut-
Black sagebrush	Fringed sagebrush*	tings)*
Blueberry elder *	Gambel oak*	Parry rabbitbrush*
Boxelder*	Gardner saltbush*	Peking cotoneaster*
Common bladdersenna*	Longflower snowberry*	Purpleosier willow*
Common lilac*	Martin ceanothus*	Redberry elder*
Creeping barberry*	Mountain snowberry*	Rocky Mountain sumac*

Table 11 . Continued

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 eriogonum

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 C

Commercial Sources for Plant Materials

POSSIBLE SOURCES FOR TRANSPLANTS

Harper's Nursery
1830 E. McKellips Road
Mesa, Arizona 85201

Powderhorn Nursery
10100 E. Cactus Road
Scottsdale, Arizona 85237

Clyde Robins
Native Seeds and Plants
P.O. Box 2091
Castro Valley, Calif. 94546

Sweets Progressive Landscape Service
Star Route
Oakhurst, Calif. 93644
(Propogates shrubs native in the
mountains for roadside control)

Western Evergreen, Inc.
14201 West 44th Avenue
Golden, Colorado 80401

Kroh Nursery
Loveland, Colo. 80537

Kaylor Nursery, John
Lenore, Idaho 84541

Mountain Home Nurseries
Deborgia, Montana 59830

Moran, E. C.
Stanford, Montana 59479

Plumfield Nursery, Inc.
2105 N. Nye St., Box 410
Fremont, Nebraska 68025

Pacific Coast Nursery, Inc.
Rt. 1, Box 320
Portland, Oregon 97321

Sherwood Nursery Co.
13020 N.E. Rose Parkway
Portland, Oregon 97230

Native Plants (801-466-5332)
P.O. Box 15526
2842 South West Temple
Salt Lake City, Utah
(This is the greenhouse address.)

Native Plants
440 Wakara Way
Salt Lake City, Utah 84108
(This is the office in town.)

Paul Sjoblom
State Forestry and Fire Control
231 E. 4th South
Salt Lake City, Utah 84111
(You might be able to contact the
Clark-McNary Nursery through him)

Heather Acres
Route 3, Box 231
Elma, Washington 98541

Heather Acres
4730 - 132nd Place NE
Marysville, Washington 98270

Steward Nursery, W.M.
Route 2, Box 225
Maple Valley, Washington 98038

Kruse Nursery, Inc.
E. 3900 Sprague Avenue
Spokane, Washington 99202

WILDLAND SEED COLLECTORS

- Desert Seed
Box 68
Morristown, Arizona 85342
- Desert Botanical Garden
Box 5415
Phoenix, Arizona 85010
- Desert Plants
2735 E. Camelback
Phoenix, Arizona 85016
- Arizona Cypress Gardens
Star Route 2
Sedonna, Arizona 86336
- Arizona, University of Desert
Biology State
P.O. Box A.B.
Superior, Arizona 85273
(Exchanges seed with research organizations and botanical gardens)
- Tanque Verde Nursery
Route 2, Box 774 P
Tucson, Arizona 85715
- Thornton, Bill
3014 North Fremont
Tucson, Arizona 85719
- Stephenson, Virginia L.
Box 926
Colorado Springs, Colorado 89099
- Illiff Gardens
4750 East Illiff Avenue
Denver, Colorado 80222
- Mile High Seed Company (303-242-3122)
Box 1988
Grand Junction, Colorado
- Applewood Seed Company
12125 W. 26th Avenue
Lakewood, Colorado 80215
- Longmont Seed Company
Longmont, Colorado 80501
- Northrup King & Company (208-342-897)
520 South Ninth Street
Boise, Idaho
- Loring Jones (208-882-8040)
Northplain Seed Producers
P.O. Box 9107
Moscow, ID 83843
- Moran, E.C.
Stanford, Montana 59479
(Woody plant seed only)
- Lawrence, S.S.
Box 405
Las Vegas, Nevada 89100
- S.M. Clark
P.O. Box 606
Cedar City, Utah 84720
- C. & S. Seed Enterprises
c/o Eric Christensen
Ephraim, Utah 84627
- Gary L. Jorgensen
P.O. Box 102
Ephraim, Utah 84627
- John Plummer
Ephraim, Utah 84627
- Lloyd Stevens
Ephraim, Utah 84627
- Roger Stewart (801-283-4423)
Ephraim, Utah 84627

Wildland Seed Collectors (Continued)

Jacklin Seed Co., Inc.
Dishman, Washington 99213

English, Carl S.
8546 30th Avenue
Seattle, Washington

Game Food Nurseries
Box 3710
Oshkosh, Wisconsin 54901
(Aquatic game foods)

COMMERCIAL SEED COLLECTORS

These are seed companies which deal mainly in grass and legume seed, although they do have small assortments of browse seed. Each has a price list and species lists which they supply.

- | | |
|---|--|
| Emac Seed Co.
Rt. 1, Box 850
Willcox, AZ 85643 | Western Evergreens, Inc.
14201 West 44th Avenue
Golden, Colorado 80401
(Specialize Yucca) |
| Robin, Clyde
P.O. Box 603
Arcata, California 95521 | Longmont Seed Co.
51 Bowen Street
P.O. Box 923
Longmont, Colo. 80501 |
| Clyde Robin Seed Co., Inc.
Mr. Steven R. Atwood, V.P.
P.O. Box 2091
Castro Valley, CA 94546 | Northrup King & Co.
P.O. Box 192
Longmont, Colo. 80501 |
| Environmental Seed Producers Inc.
P.O. Box 5904,
El Monte, Calif. 91734 | Mile-High Seed Co.
Box 1988
Grand Junction, Colo. 81501 |
| Berger & Plate Co.
P.O. Box 7697
San Francisco, CA 94120 | Timerline Tree Seed
Rye Star Route, Box 145
Pueblo, Colorado 81004 |
| S & S Seed
382 Arboleda Rd.
Santa Barbara, CA 93110 | Arkansas Valley Seeds, Inc.
Box 270
Rocky Ford, Colo. 81067 |
| Arkansas Valley Seeds
Box 270
Rocky Ford, Colorado 81067 | Beaver Enterprises
3416 Tamarack
Boise, Idaho 83702 |
| Arkansas Valley Seed Co.
Attn: Robert Appleman
3131 E. Alameda, Apt. 2104
Denver, Colorado 80209 | Northrup King & Co.
Box 7746
Boise, Idaho 83707 |
| Carhart, Ross O.
Dove Creek, CO 81324 | Northrup King and Co.
520 S. 9th
Boise, Idaho 83703 |
| Mile High Seed Co.
Box 1988
Grand Junction, Colo. 81501 | The Gooding Seed Co.
Box 57
Gooding, Idaho 83330 |

Northplan Seed Producers Box 9107 Moscow, Idaho 83843	Curtis and Curtis, Inc. Star Route, Box 8A Clovis, New Mexico
Delbert Winterfeld Box 97 Swan Valley, Idaho 83449	Miller Seed Co. P.O. Box 81823 Lincoln, Nebraska 68501
Globe Seed & Feed Co. Inc. Box 445 Twin Falls, Idaho 83301	Plumfield Nurseries, Inc. 210 N. Nye Avenue Box 410 Freemont, Nebraska 68025
Globe Seed and Feed Co. Mr. L.H. Haslam Truck Lane Twin Falls, Idaho	Simpson Timber Company P.O. Box 308 Albany, Oregon 97321
Sasaki and Sasaki Farm Rt. 1 Box 173-B Weiser, Idaho 83672	Dick Haynes, Farmterials, Inc. Baker, Oregon 97814
Sharp Bros. Seed Co. (316-398-2231) P.O. Box 11 Healy, KS 67850	Mallery, D.B. 1506 NE Northview Bend, Oregon 97701
Cenex Seed Co. P.O. Box 1748 Billings, MT 59103	Coos Grand Supply 1085 S. Second St. Coos Bay, Oregon 97420
Montana Seeds, Inc. Rt. 3, Conrad, Montana 59424	Nomad Alfalfa, Inc. P.O. Box 217 Forest Grove, Oregon 97116
Christensen, Art Box 186 Dillon, Montana 59725	McFarland Trading Co. P.O. Box 68 Hubbard, Oregon 97032
Eisenman Seed Co. Fairfield, Montana 59436	Siskiyou Rare Plant Nursery 522 Franquette Street Medford, Oregon 97501
Lawyer Nursery, David A. Plains, Montana 59859	Garrison, C.C. 103 Southeast Third Avenue Milton-Freewater, Oregon 97862
Moran, E.C. Stanford, Montana 59479	North Coast Seed Co. P.O. Box 12185 Portland, Oregon 97212

Commercial Seed Collectors (Continued)

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Conifer Seed Company
5182 Sunnyside Road
Salem, Oregon 97302

Reforestation Services, Inc.
P.O. Box 3291
Salem, Oregon 97302

Hansmeier & Son, Inc.
Bristol, SD 57219

Sharp Bros. Seed Co.
4378 Canyon Dr.
Amarillio, TX 79109

Horsely-Cummings Seed Co.
Mr. Dave Cummings (801-723-5246)
P.O. Box H
Brigham City, Utah 84302

Steven Bros.
P.O. Box 496
Ephraim, Utah 84627

Boyd E. Globe & Sons
Gunnison, Utah 84634

Charles Inouye
Gunnison, Utah 84634

Rocky Mountain Landscaping
& Sprinkler
P.O. Box 624
Ogden, Utah 84401

Northrup-King & Co.
380 West 8th South
P.O. Box 148
Salt Lake City, Utah 84111

Jacklin Seed Company, Inc.
Dishman, WA 99213

Western Tree Seed Company
Route 1, Box 99
Granite Falls, Washington 98252

Esses Tree Seed Co.
401 South 7th Street
Montesano, Washington 98563

Manning Seed Co.
Roy, Washington 98580

Robert Dye Seed Ranch, Inc.
Pomerdy, WA 99347

Jacklin Seed Co. (Div. of the
Vaughn-Jacklin Corp.)
Mr. John Thorne, Ph.D., Research Direct
(509-926-6241)
E 8803 Sprague Ave.
Spokane, WA 99206

Brown Seed Company
P.O. Box 1792
Vancouver, WA 98663

Etheridge, Paul H.
Star St., Box 235B
Powell, WY 82435

Vic's Enterprises
319 McKinley
Rawlins, WY 82301

Northplan Seed Products
P.O. Box 9107
Moscow, ID 83843

Commercial Seed Collectors (Continued)

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ABC Seed 343 East Broadmor Drive Tempe, AZ 85282	Mrs. Dorothy Fultz 611 West Vine Avenue Mesa, AZ 85201
Advance Seed Company 310 South 24th Avenue Phoenix, AZ 85008	Northrup-King and Company Box 6069 Phoenix, AZ 85005
Apache Coat Seed Company 1 412 East Pierce Street Phoenix, AZ 85006	Perry's Plants, Inc. 3221 East Baseline Phoenix, AZ 85054
Bill Thornton 1619 East Eighth Tucson, AZ 85719	Silverbell Nursery 2730 North Silverbell Road Tucson, AZ 85705
Camelot Nurseries, Inc. 6030 Mockingbird Lane Scottsdale, AZ 85251	Tip Top Nurseries 2941 North Forty-third Avenue Phoenix, AZ 85031
Catalina Heights Nursery 6047 East Pima Tucson, AZ 85716	Valley Seed Company Box 1110 Phoenix, AZ 83635
Emac Seed Company Box 338 Wilcos, AZ 85643	Applewood Nursery and Seed Co. 15001 West 32nd Avenue Route 3, Box 84 Golden, CO 80401
Ferry-Morse Seed Company 310 South 24th Avenue Phoenix, AZ 85005	Arkansas Valley Seeds Rocky Ford, CO 81067
Germain's Inc. Box 1347 Glendale, AZ 85301	Dean Swift Box 24 Jaroso, CO 81138
Greenland Nursey 7909 East 22nd St. Tucson, AZ 85710	George Kelly McElmo Creek Route Cortez, CO 81321
Harlow Hursey 5620 East Pima Tucson, AZ 85716	Neco, Inc. Box 1178 Cahone, CO 81320
Liefgreen Seed Company Glendale, AZ 85301	Northrup King and Co. Box 998 Longmont, CO 80501

Commercial Seed Collectors (Continued)

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Northrup King and Company 1621 West 12th Avenue Denver, CO 80204	Ben Lund Big Sandy, MT 59520
Ross O. Carhart Dove Creek, CO 81324	Bennie Gevig Plevna, MT 59334
San Juan Native Nursery Box 302 Pagosa Springs, CO 89117	Bitter Root Nursery Corvallis, MT 59828
Steamboat Landscaping, Inc. Box 1521 Steamboat Springs, CO 80477	Boyd Crawford Fort Benton, MT 59442
Robert Appleman Arkansas Valley Seed Company 3131 East Alameda, Spt. 2104 Denver, CO 80209	Canyon Creek Nursery West Billings, MT 59101
Timberline Tree Seed Rye Star Route Box 145 Pueblo, CO 81104	Cenex Seed Company Box 1748 Billings, MT 59103
Yellow Pine Nurseries Box 192 Kiowa, CO 80117	David A. Lawyer Nursery Plains, MT 59859
Environmental Landscapes, Inc. 2442 West Evans Avenue Denver, CO 80202	Eisenman Seed Company Fairfield, MT 59436
Sharp Brothers Seed Company Healy, KS 67850	F.B. Arnett Columbia Falls, MT 59072
A.L. Bruce Seed Company Townsend, MT 59664	Frank Rose 1020 Popular Street Missoula, MT 59801
Adsit Farm and Ranch Services Decker, MT 59025	Gerald H. Tohman Route 2 Geraldine, MT 59446
Art Christensen Box 186 Dillon, MT 59725	Gilbert Ehli Sweetgrass, MT 59484
Arthur DeGrand Baker, MT 59313	Hayden Porter Decker, MT 59025
	James Crandall Scobey, MT 59263

Joe Lincoln Valier, MT 59486	Thomas F. Burns Chinook, MT 59523
K and K Seed Company Route 3 Conrad, MT 59425	Tom Adsit Decker, MT 59025
Ken Coulter Brusett, MT 59318	Valley Nursery Box 845 2801 North Montana Avenue Helena, MT 59601
Marchie's Nursery 1845 South Third West Missoula, MT 59801	Wallace Edland Scobey, MT 59263
Mart Crestainger Eaker, MT 59313	Wanner Nursery Corvallis, MT 59828
Montana Seeds, Inc. Route 3 Conrad, MT 59425	Wesley Adolph Roundup, MT 59072
Nathan Manakee Cascade, MT 59421	Western Seed and Supply, Inc. Box 57 Charlo, MT 59824
Northrup-King and Company Box 389 Billings, MT 59103	Willia, Skorupa Bridger, MT 59014
Powder River Seed Company Box 673 Broadus, MT 59317	Cactiflor Box 787 Balew, NM 87002
R.M. Gregor Landscaping 1310 Greene Street Helena, MT 69501	Curtis and Curtis Seed and Supply, Inc. Star Route, Box 8A Clovis, NM 88101
Robert Hungate Stanford, MT 59479	C.H. Diebold Box 330, RFD 3 Los Lunas, NM 87031
Snowline Tree Company, Inc. Highway 93 South Halispell, MT 59901	Dan Cristo New Mexico Native Plant Nursery of S.W.S.H. 309 West College Avenue Silver City, NM 88061
State Nursery Company West Helena, MT 59601	Grasslands Resources, Inc. Santa Fe, NM 87501

Commercial Seed Collectors (Continued)

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Jose Montano, Director Mora Research Center Box 357 Mora, NM 87732	Arvid Mahalan Sturgis, SD 57785
Leslie Clayshulte Agricultural Seed Company Drawer A Mesquite, NM 88048	Clark Dale Nursery Milbank, SD 57252
Mountain States Chemical Co., Inc. 316 Industrial Northeast Albuquerque, NM 87107 Mountain Valley Nursery Box 81 Lincoln, NM 88338	Clarkdale Nursery Rural Route 1 Twin Brooks, SD 57269
Sam Donaldson 70 San Juan Los Alamos, NM 87544	Clyde Barr Prairie Gem Ranch Smithwick, SD 57782
Clinton Sidwell Battle Mountain, NV 89820	Gurney Seed and Nursery Company Second and Capital Yankton, SD 57078
Dan Aten Battle Mountain, NV 89820	Hansmeier and Sons, Inc. Bristol, SD 57219
S.S. Lawrence Box 405 Las Vegas, NV 89100	Merl Gunderson Nursery Rapid City, SD 57701
Fey's Nursery and Seed Company Sheldon, ND 58068	Robert D. Larson Alzada Route Belle Fourche, SD 57717
Forestry Seed Market Box 156 Sheldon, ND 58068	Sexauer Company Brookings, SD 57350
Lincoln-Oakes Nurseries Box 1601 Bismarck, ND 58501	Boyd E. Goble and Sons Gunnison, UT 84634
State Forest Nursery Bottineau, ND 58318	John C. Cook 387 North 800 East American Fork, UT 84003
	Kent Jorgensen 130 East Second North Ephraim, UT 84627
	Hyle Christensen 4485 Ebony Avenue Salt Lake City, UT 84107

Mark Plummer
190 North Second West
Ephraim, UT 84627

Yoder Grain and Lumber Company
Torrington, WY 82240

Porter Walton Company
Box 1919
522 South Third West
Salt Lake City, UT 84110

Ron Stevenson
Ephraim, UT 84627

Roy Grosbeck
3522 West Cambridge
Granger, UT 84119

Steve Regan Company
451 South 400 West
Salt Lake City, UT 84101

Stevens Brother's Wildland Seed
and Nursery
Box 496
Ephraim, Utah 84627

William Roger Steward and Sons
Box 124
Ephraim, UT 84627

Carroll Riggs Seed Company
Shoshoni, WY 82649

Clouds Seed Company
P.O. Box 937
Sheridan, WY 82801

Mrs. Leone Byrne
Lyman, WY 82937

Paul Etheridge
Star Route 1, Box 235-B
Powell, WY 82435

Paul Schultz
Star Route, Box 223
Powell, WY 82435