APPENDIX A

THE GRAND MESA WETLAND FUNCTION AND VALUE ASSESSMENT

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Grand Mesa Wetland Function and Value Assessment
(Grand Mesa Method)

WestWater Engineering, Inc.

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Introduction

The Grand Mesa Method is intended as a tool for assessing existing wetland functions and wetland values on the Grand Mesa, Colorado between 9,000 and 11,000 ft. elevation. The purpose of this tool is to provide experienced natural resource specialists with a systematic, qualitative approach to scoring wetlands. This approach minimizes subjectivity by considering a wide range of potential functional conditions common to wetlands on the Grand Mesa in a consistent format. The assessment provides a relative comparison of wetlands. It helps to determine whether wetland functions are diminished, and helps to identify potential restoration or enhancement opportunities.

The Grand Mesa Method is comprised of basic site-specific information followed by seven scoring indices (Table A-1). These indices are weighted based on the relative importance of the individual index as determined by an interdisciplinary workgroup including Grand Mesa, Uncompahgre and Gunnison National Forests (GMUG) Grand Mesa Ranger District specialists, COE representatives and Third Party WestWater Engineering (WWE) scientists. Each of these indices is assigned a percentage (or weight factor) of the total. The Index Values (IV) multiplied by their respective weight factor (WF) equals the Weighted Index Value (WIV). That is IV * WF = WIV. The sum of the WIVs is the Total Weighted Index (TWI). That is ∑WIV = TWI. The TWI is then multiplied by the number of acres in the wetlands (A) to determine the Functional Value (FV). That is, TWI * A = FV. The assessment provides a relative comparison of wetlands. It helps to determine whether wetland functions are diminished and identify potential restoration or enhancement opportunities using quantitative values.

Table A-1 Summary of Index Ratings

Indices	Index Value	Weight Factor		Weighted Index Value
		Surface Water Present	No Surface Water	
1.0 Hydrogeomorphology Condition Index		.25	.35	
2.0 Vegetation Index		.25	.25	
3.0 Water Quality Index		.1	0	
4.0 Wildlife Habitat Index		.05	.05	
5.0 TESS Index		.15	.15	
6.0 Recreation Index		.05	.05	
7.0 Buffer Condition Index		.15	.15	

Functional Value Calculation

∑ Weighted Index Values (TWI)	Acres (A)	Functional Value (FV)

Method Development

Development of the Grand Mesa Method included thorough review of several existing assessment methods (see references). The format of the Grand Mesa Method is primarily based on the Montana DEQ-Wetland Rapid Assessment Guide Book and related Rapid Assessment Form (Montana Method) (Apflebeck and Farris, 2005).

Table A-2 provides a brief comparison of the Montana Method and the Grand Mesa Method to highlight similarities and differences of the two methods. In general, the Grand Mesa Method was developed to address characteristics of wetlands of the Grand Mesa, and the scoring scheme was developed to appropriately compare wetlands of the Grand Mesa between 9,000 and 11,000 feet elevation.

Method Implementation

WWE assessed a total of 20 existing Grand Mesa Wetlands in order to develop the Grand Mesa Method. In order to assure consistent scoring, the project team was limited to the same group of assessors throughout the effort. Prior to initiation of application of the Grand Mesa Method, a preliminary assessment workshop was held where all team members independently scored a selected wetland. As a group, team members reviewed results of the scoring and compared their quantitative scores of the characteristics of each of the indices. An example form is provided in Attachment F-1.

A total of 20 existing Grand Mesa wetlands were compared to provide a perpective of the WIVs and FVs present on the Grand Mesa (Table A-2). This analysis included rating two reference areas (1) Coyote Fen, for wetlands, and (2) Monument Creek, for riverine factors. Reference sites are considered areas of high value relative to other areas of the Grand Mesa, as selected by the EIS team. The WIV ranged from .40 (Upper Colby Horse Road) to .87 (Coyote Fen). Coyote Fen was therefore used as a reference site. The FV ranged from a low of .54 at the West Leon Creek to a high of 39.85 at the Coyote Fen Reference Area (see Table A-2). In comparing functional value at wetlands sites, it is important to realize that a site with a relatively low WIV, may have a high FV only because of the larger area (i.e., more acres).

For example, the existing wetland of Hunter Reservoir, including the fen, was assessed using the Grand Mesa Method. The existing Hunter Reservoir WIV is .50. When compared to the range of WIV values (0.40 to 0.87), it is at the lower end of the functionality range. However, the FV of Hunter Reservoir is at the high end of the range (23.25) due it its large area alone. Actually, Hunter Reservoir, when compared to the Coyote Fen Reference Site, is only 21% of the possible functionality (WIV) (Table A-2).

Table A-2. Functional Value of Wetlands Evaluated with the Grand Mesa Method			
Wetland	**∑ Weighted Index Values**	**Acres**	**Functional Value (FV)**
Hunter Reservoir	0.50	46.50	23.25
Leon Creek Road	0.54	6.00	3.23
W. Leon Creek	0.49	1.10	0.54
Upper W. Leon Creek	0.48	6.60	3.19
Barnes & Monroe	0.83	13.8	11.4
Coon Creek Drainage	0.71	14.0	9.99
Coopers	0.75	4.89	3.76
Bingo	0.58	7.90	4.62
Stubbs & Clarke	0.43	1.30	0.56
Upper Colby Horse	0.40	1.77	0.71
SP Road	0.62	4.00	2.47
Coyote (reference site)	0.87	46.0	39.85
Lower Colby Horse (Mid Leon)	0.67	3.50	2.35
Elephant	0.45	5.60	2.51
Monument Creek (reference site)	0.81	6.00	4.85
Horse	0.80	6.15	4.90
Chipmunk	0.80	5.06	4.07
Safety #1	0.49	7.60	3.71
Bull Creek #5	0.75	3.5	2.63
Sloping	0.65	1.10	0.72

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Table A-2. Comparison of the Montana Method and Grand Mesa Method	
Montana Method	Grand Mesa Method
Section 1.0 and 2.0 are site characterization information that is not directly used in the assessment scoring.	Site characterization is performed on page 1. A Summary of Index Scores Weighted Index Values, and overall wetland value is provided on page 1.
Indices Used In Assessment	
3.0 Hydrogeomophology 4.0 Vegetation 5.0 Water Quality 6.0 Buffer Condition	1.0 Hydrogeomophology 2.0 Vegetation 3.0 Water Quality 4.0 Wildlife Habitat 5.0 TESS 6.0 Recreation 7.0 Buffer Condition
Hydrogeomorphic (include Riverine if present)	
3.1 Degree of wetland disturbance	1.1.1 Amount of wetland negatively altered
3.2 Degree of wetland negatively altered	1.1.2 Degree of wetland alteration
3.3 Amount of wetland altered by dredge or fill	1.1.3 Effects on flow patterns and soils
3.4 Percent/ degree of animal hoof impact	1.1.4 Amount of animal hoof impact
	1.1.5 Long term protection potential
Muliplier (weight): 0.03 or 0.04	Weight Factor: .25 or .35
Hydrogeomorphic/Riverine Wetlands	
3.5 Downcutting/incisement	1.2.1.1 Overall floodplain condition
3.6 Percent of stream banks with lateral cutting	1.2.1.2 Signs of inundation
3.7 Stream in balance with water/sediment	1.2.1.3 Portion floodplain non-functional
3.8 Floodplain characterization	1.2.1.4 Degree of degradation
3.9 Streambank vegetation	1.2.1.5 Signs of entrenchment
3.10 Percent of bank with binding rootmass	1.2.2.1 Bank stability
	1.2.2.2 Amount of bank not in balance
	1.2.2.3 Degree of effect in unstable area
	1.2.3.1 Evidence of excessive sediment
	1.2.3.2 Evidence of headcuts
	1.2.3.3 Channel incisement
	1.2.4.1 Portion of reach road crossings affect
	1.2.4.2 Degree of degradation at crossings
	1.2.4.3 Channel has been hardened at crossings
	1.2.4.4 Road grades into crossings minimized
Vegetation Index	
4.1 Percent bare ground	2.1.1 Percent bare ground
4.2 Percent invasive plants	2.1.2 Percent rel. cover of wetland plants
4.3 Percent noxious weeds	2.1.3 Non-native invasive species
4.4 Woody species establishment	2.2 Vegetative structure
4.5 Utilization of trees and shrubs	2.3 Diversity
4.6 Percent of removal by grazing	2.4 Level of disturbance
Muliplier (weight): 0.30 or 0.40	Weight Factor: 0.25
Water Quality Index	
5.1 Algae and duckweed	3.1 Algal growth
5.2 Dominated by cattails	3.2.1 Evidence of excessive sediment
5.3 Sediment and turbidity	3.2.2 Evidence of turbidity
5.4 Surface oils & foam	
5.5 Toxic contaminants	
5.6 Salinity	
Muliplier (weight): 0.20	Weight Factor: 0.10 or 0

Table A-2. Comparison of the Montana Method and Grand Mesa Method	
Montana Method	Grand Mesa Method
Wildlife Habitat Index	
	4.1 Predator habitat
	4.2 Herbivore habitat
None	4.3 Bird habitat
	4.4 Reptile habitat
	4.5 Aquatic species habitat
	Weight Factor: 0.05
TESS Index	
	5.1 Terrestrial mammals (Lynx)
	5.2 BOCC birds
	5.3 Aquatic/semi aquatic (boreal toad, CRCT
None	5.4.1 Fen: concentration of rare species present
	5.4.2 Fen: probability to persist
	5.4.3 Fen: quality/diversity in species/structures
	5.4.4 Fen: research/educational potential
	Weight Factor: 0.15
Recreation Index	
	6.1 Fishing
	6.2 Hunting
None	6.3 Hiking
	6.4 Nature viewing
	Weight Factor: 0.05
Buffer Condition Index	
100m buffer/slope category	10m buffer x slope factor
6.1 Amount of bare ground	7.1.1 Amount of bare ground
6.2 Noxious weeds	7.1.2 Non-native invasive species
6.3 Undesirable plants	7.1.3 Area affected by grazing
6.4 Grazing intensity	7.1.4 Roads, trails, camping
6.5 Recreational activities	7.1.5 Level of grazing disturbance
6.6 Percent in hayfield	7.1.6 Disturbance from roads, trails, camping
6.7 Percent in row crops	
6.8 Percent in clear cuts	100m buffer x slope factor
6.9 Percent with concentrated livestock use	7.2.1 Amount bare ground
6.10 Percent with residential development	7.2.2 Non-native invasive species
6.11 Dams present or absent	7.2.3 Area affected by grazing
6.12 Percent with human induced saline seeps	7.2.4 Roads, trails, camping
6.13 Percent with industrial/commercial use	7.2.5 Level of grazing disturbance
6.14 Percent with oil & gas use	7.2.6 Disturbance from roads, trails, camping
6.15 Identify type of use in 100-500m buffer	
6.16 Distance from 2 track road upslope	
6.17 Distance to other 2 track roads	
6.18 Distance to dirt/gravel roads, RR grade	
6.19 distance to other roads	
6.20 Distance to paved roads upslope	
6.21 Distance to other paved roads	
Muliplier (weight): 0.20	Weight Factor: 0.15

ATTACHMENT F-1
GRAND MESA METHOD FORM

Grand Mesa 9,000 to 11,000 ft Elevation Wetland Function and Value Assessment Form WestWater Engineering November 2006	
Date:	Observer(s) Initials
Job Number:	Datum: WGS 84 (NAD 83) or NAD 27
Site Name:	UTM E_____________ N_____________
Land Ownership:	Error +/-_____m
Water Rights:	Elevation: ________ft. or m

General Site Description (Size, Wildlife Observations, Features, Vegetation, Impacts, Alterations.)
Wetland Type: Riparian (Fringe), Wet Meadow, Peatland
HGM Class: Slope, Depressional, Riverine, Fringe

Photo Points			
UTM Location		Direction	Comments:

Summary of Index Ratings				
	Index Value	Weight Factor		Weighted Index Value
		Surface Water Present	No Surface Water	
2.0 Hydrogeomorphology Condition Index		.25	.35	
2.0 Vegetation Index		.25	.25	
3.0 Water Quality Index		.1	0	
4.0 Wildlife Habitat Index		.05	.05	
5.0 TESS Index		.15	.15	
6.0 Recreation Index		.05	.05	
7.0 Buffer Condition Index		.15	.15	

Functional Value Calculation		
∑ Weighted Index Values	Acres	Functional Value (FV)

1.0 Hydrogeomorphology Condition Index: (For all wetland types, includes addendum for Riverine Wetlands) **Circle one value in each number item.**			
1.1 Degree of hydrologic disturbance	Non Occurring → Slight → Moderate → Severe		
1.1.1 Amount of wetland surface area that has been **negatively** impacted by altered surface or subsurface flow patterns (consider abnormal fluctuating water levels caused by roads, bridges, dams, rip rap)	10 9 8 7 6 5 4 3 2 1 0		
1.1.2 Indicate the condition of the wetland habitat that has been **negatively** impacted by altered surface or subsurface flow patterns.	10 9 8 7 6 5 4 3 2 1 0		
1.1.3 Rate the **negative** effects of altered surface and subsurface flow patterns on soil condition (compaction, reduced infiltration capability, surface crust, and erosion).	10 9 8 7 6 5 4 3 2 1 0		
Percent of wetland area that has been **negatively** affected by pugging or hummocking from animal hooves.	<25%	25-75%	>75%
1.1.4 Circle a value in the wetland percent column to indicate the degree of hoof impact.	None 10 Slight 9 Moderate 7 Severe 5	Slight 6 Moderate 3 Severe 1	Slight 4 Moderate 2 Severe 0

Slight – Pugging is minimal or shallow/Hummucking has occurred/ Vegetation and bank stability are intact or recovering.
Moderate – Pugging is minimal/ Hummucks are deep/ Wetland is beginning to dry out.
Severe – Hummucks are deep/ Pugging is common/ Vegetation is dead or absent.
Pugging – Patches of bare ground where extreme trampling has stomped out all vegetation.
Hummucks – Large humps in the soil where vegetation has begun to dry out and soils begin to erode.

1.1.5 Long term protection potential : rate potential from 0 to 10 based on potential for long-term protection such as existing rights that may threaten wetland (Dam construction/maintenance) **(Determined in Office)**	SIA	No Existing Rights	Existing Rights	Proposed Action	Current Activity
	10	8	5	2	0

Hydrogeomorphology Condition Index: add scores from rows 1.1.1 through 1.1.4 and divide by 40
(for sites without riverine systems this is the Total Hydrogeomorphology Index)
(2 x ____)+____+____+____+___/60 = *____

For Sites with Riverine systems fill out Riverine Addendum 1.2.0 and add Riverine Index (Section 1.2) to **Hydrogeomorphology Index** and divide by 2 for Total Hydrogeomorphology Index
(*____+ **____)/2 = ____

Comments:

Addendum 1.2.0: Hydrogeomorphology – Riverine Wetlands Index	
1.2.1 Floodplain Characterization	
1.2.1.1 Overall floodplain condition (e.g. sediment deposition, erosion, capability to dissipate channel energy). Consider entire reach	Excellent → Very Good → Fair → Poor 10 9 8 7 6 5 4 3 2 1 0
1.2.1.2 Floodplain shows signs of inundation from runoff events (debris, water marks).	Occurring → Moderate → Slight → Not Occurring 10 9 8 7 6 5 4 3 2 1 0
1.2.1.3 The portion or area of the floodplain that is in non-functioning or poorly functioning condition (Percentage of area relative to the entire reach).	None → Low → Moderate → High → Very High 10 9 8 7 6 5 4 3 2 1 0
1.2.1.4 Degree of degradation in the portion or area of the floodplain that is in non-functioning or poorly functioning condition.	Very High → High → Moderate → Low → None 10 9 8 7 6 5 4 3 2 1 0
1.2.1.5 Stream corridor shows signs of entrenchment (Floodplain width not proportional to bankfull width for stream type and setting).	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.2 Channel Bank Characterization	
1.2.2.1 Banks are stable and indicate ability to handle variable flow velocities (sustain vegetation, armored with boulders, show no evidence of severe erosion).	Occurring → Moderate → Slight → Not Occurring 10 9 8 7 6 5 4 3 2 1 0
1.2.2.2 Portion or area of the bank that is not in balance with stream (erosion, excessive lateral movement, evidence of stream widening) relative to entire reach.	None → Low → Moderate → High → Very High 10 9 8 7 6 5 4 3 2 1 0
1.2.2.3 Degree of degradation in portion or area of bank that is not in balance with the stream.	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.3 Channel Characterization	
1.2.3.1 Evidence of excessive sediment removal or deposition, or that the stream is getting wider.	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.3.2 Evidence of headcuts.	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.3.3 Channel is incising. Channel width to depth ratio appears to be **inappropriate** for the stream type, or geomorphic setting (downcutting, lowering of groundwater table).	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.4 Disturbance at Riverine Crossings (roads, trails, or livestock)	
1.2.4.1 Portion or area of the reach where crossing(s) have had a negative effect on the channel.	Non Occurring → Slight → Moderate → Severe 10 9 8 7 6 5 4 3 2 1 0
1.2.4.2 Degree of in channel degradation from crossings.	None → Low → Moderate → High → Very High 10 9 8 7 6 5 4 3 2 1 0
1.2.4.3 Channel has been effectively hardened (armored) or diverted (culvert) to minimize in channel impact at crossings.	Excellent → Very Good → Fair → Poor 10 9 8 7 6 5 4 3 2 1 0
1.2.4.4 Road grades have been minimized on both sides of a riverine crossing to minimize stream impact.	Excellent → Very Good → Fair → Poor 10 9 8 7 6 5 4 3 2 1 0
Riverine Index: Sum of the actual scores and divide by the sum of maximum possible (150) ____+____+____+____+____+____+____+____+____+____+____+____+____+____+____ = ____ /150	
	Total Riverine Index score =**____

2.0 Vegetation Index: Vegetation is assessed within the wetland assessment area					
2.1 Vegetative Cover - % Cover					
2.1.1 % Bare Ground (Exposed Soil)	0	>0-5%	>5-15%	>15-25%	>25%
Score	10 9	8 7	6 5	4 3	2 1 0

2.1.2 % Relative Cover of Wetland Plants that are FacWet and Obligate.	90-100%	90 – 75%	50-75%	>50%
Score	10 9	8 7 6	5 4 3	2 1 0

2.1.3 Non-native Invasive Species including noxious weeds.	0	>0-5%	>5-15%	>15-25%	>25%
Score	10 9	8 7	6 5	4 3	2 1 0

2.2 Structure							
How many vegetation strata (present over >10 % of the area) are represented? Submerged aquatic, emergent aquatic, terrestrial herbaceous, sub-shrub (<.2m high) shrub (.2-1m high), tall shrub (>1m high), tree.	7 Strata	6 Strata	5 Strata	4 Strata	3 Strata	2 Strata	1 Strata
Score	10	9	8	7	5	3	1

2.3 Diversity					
Number of Species with > 10% relative cover.	5 (or more)	4	3	2	1
Score	10	8	6	4	2

2.4 Disturbance					
How much wetland vegetation is impacted by grazing or other disturbance.	0	>0-5%	>5-15%	>15-25%	>25%
Score	10 9	8 7	6 5	4 3	2 1 0

Vegetation Index
Sum all scores and divide by the total possible (60)

____+____+____+____+____+____ = ____ /60 = ____

Comments:

3.0 Water Quality Index: If No Surface Water Leave Blank				
3.1 Algal Growth - large patches means >50% of area.	Algae growth is minimal	Algae growth in small patches	Algae growth in large patches	High level of algae growth in continuous mats with odor from rotting vegetation
	10	8	4	0

3.2 Sediment and Turbidity	Very High	→	High	→	Moderate	→	Low	→	None		
3.2.1 Is there evidence of excessive sediment levels?	10	9	8	7	6	5	4	3	2	1	0
3.2.2 Is the Water Turbid?	10	9	8	7	6	5	4	3	2	1	0

Water Quality Index: Sum the scores of 3.1 through 3.2.3 and divide by 30.

____+____+____= ____ /30 = ____

4.0 Wildlife Index: Relative value as compared to other areas of the Grand Mesa.											
Habitat Value assessed as:	Very High	→	High	→	Moderate		→	Low	→	None	
4.1 Habitat value for predators	10	9	8	7	6	5	4	3	2	1	0
4.2 Habitat value for herbivores	10	9	8	7	6	5	4	3	2	1	0
4.3 Habitat values for birds	10	9	8	7	6	5	4	3	2	1	0
4.4 Habitat value for reptiles	10	9	8	7	6	5	4	3	2	1	0
4.5 Habitat value for aquatic species (fish and amphibians)	10	9	8	7	6	5	4	3	2	1	0
Wildlife Index Sum scores and divide by 50 (total possible)	____+____+____+____+____/50 = ____										

5.0 Threatened, Endangered, Sensitive Species and Unique Vegetation Associations (TESS) Index: Relative value as compared to other areas of the Grand Mesa.											
Habitat Value assessed as:	Very High	→	High	→	Moderate		→	Low	→	None	
5.1 Terrestrial Mammals (Lynx)	10	9	8	7	6	5	4	3	2	1	0
5.2 BOCC and FSS birds	10	9	8	7	6	5	4	3	2	1	0
5.3 Aquatic/Semi-aquatic species (Boreal toad, Colorado River Cutthroat Trout)	10	9	8	7	6	5	4	3	2	1	0
TESS Condition Index Sum scores and divide by 30 (total possible)	____+____+____=____/30 = *____										
5.4 Unique Vegetation Associations (Fen or Peatlands)	**Yes** **No** if **Yes** complete questions 5.4.1 – 5.4.4, if **No** enter score above as Total TESS Index Score										
5.4.1 Site has a concentration of rare species, uncommon vegetation types, or Fen/ Peatland structures.	Very High → High → Moderate → Low → None 10 9 8 7 6 5 4 3 2 1 0										
5.4.2 Site has a probability to persist over a long period of time (remote from disturbance causes, probability of hydrological disturbance to source).	Very High → High → Moderate → Low → None 10 9 8 7 6 5 4 3 2 1 0										
5.4.3 Site displays quality and/or diversity in vegetative species or Fen/ Peatland structures.	Very High → High → Moderate → Low → None 10 9 8 7 6 5 4 3 2 1 0										
5.4.4 Site displays research and/or educational value and is reasonably accessible.	Very High → High → Moderate → Low → None 10 9 8 7 6 5 4 3 2 1 0										
Unique Vegetation Sub-Index Sum scores and divide by 40 (total possible)	____+____+____+____= ____/40 =**____										
Total TESS Condition Index Score TESS Index + Unique Vegetation Index / 2	*____+**____ /2 = ____										
Comments:											

6.0 Recreation Index: Suitability for appropriate recreational use.											
Value for activity assessed as:	Very High	→	High	→	Moderate		→	Low	→	None	
6.1 Fishing	10	9	8	7	6	5	4	3	2	1	0
6.2 Hunting	10	9	8	7	6	5	4	3	2	1	0
6.3 Hiking	10	9	8	7	6	5	4	3	2	1	0
6.4 Nature Viewing	10	9	8	7	6	5	4	3	2	1	0
Recreation Index Sum all scores and divide by 40.	____+____+____+____ = ____/40 = ____										

7.0 Buffer Condition Index 10m buffer and 100m buffer.											
7.1 10m Buffer											
Determine dominant slope - **circle one** (1) **Flat** = <2%,, (2) : **Moderate** = 2-10%, (3) **Steep** = >10%											
Estimate slopes that could affect the wetland with overland flow and sediment deposition.											
Within 10 m buffer of assessed area. **(Circle Percentage)**	**0%**		**>0-5%**		**>5-15%**		**>15-25%**		**>25%**		
7.1.1 Amount of Exposed Soil showing erosion .	10	9	8	7	6	5	4	3	2	1	0
7.1.2 Non-native invasive plants	**0%**		**>0-5%**		**>5-15%**		**>15-25%**		**>25%**		
	10	9	8	7	6	5	4	3	2	1	0
Percent of 10m Buffer Effecting Wetland	**0%**		**>0-10%**		**>10-25%**		**>25-50%**		**>50%**		
7.1.3 Grazing Area in 10 meter buffer	10	9	8	7	6	5	4	3	2	1	0
7.1.4 Roads, Trails, Camping Areas.	10	9	8	7	6	5	4	3	2	1	0
Level of Disturbance in 10m Buffer Effecting Wetland	**None**	**→**	**Low**	**→**	**Moderate**		**→**	**High**	**→**	**Very High**	
7.1.5 Grazing Intensity	10	9	8	7	6	5	4	3	2	1	0
7.1.6 Roads, Trails, Dams, Camping Areas	10	9	8	7	6	5	4	3	2	1	0
7.2 100m Buffer (90m outside of 10m Buffer)											
Determine dominant slope **- circle one** (1) **Flat** = <2%, (2) : **Moderate** = 2-10%, (3) **Steep** = >10%											
Estimate slopes that could affect the wetland with overland flow and sediment deposition.											
Within 100 m buffer of assessed area. **(Circle Percentage)**	**0%**		**>0-5%**		**>5-15%**		**>15-25%**		**>25%**		
7.2.1 Amount of Exposed Soil showing erosion.	10	9	8	7	6	5	4	3	2	1	0
7.2.2 Non-native invasive plants	**0%**		**>0-5%**		**>5-15%**		**>15-25%**		**>25%**		
	10	9	8	7	6	5	4	3	2	1	0
Percent of 100m Buffer Effecting Wetland	**0%**		**>0-10%**		**>10-25%**		**>25-50%**		**>50%**		
7.2.3 Grazing Area in 100 meter buffer	10	9	8	7	6	5	4	3	2	1	0
7.2.4 Roads, Trails, Camping Areas.	10	9	8	7	6	5	4	3	2	1	0
Level of Disturbance in 100m Buffer Effecting Wetland	**None**	**→**	**Low**	**→**	**Moderate**		**→**	**High**	**→**	**Very High**	
7.2.5 Grazing Intensity	10	9	8	7	6	5	4	3	2	1	0
7.2.6 Roads, Trails, Dams, Camping Areas	10	9	8	7	6	5	4	3	2	1	0

Buffer Impact Index: Sum of the 3 lowest scores of 7.1 and divide by 30 (total possible) then multiply by the slope factor (10m SF), from table 1, for dominating slope in 10m buffer. Next, take sum of 3 lowest scores from 7.2 divide by 30 (total possible) than multiply by slope factor (100m SF) for dominating slope in 100m buffer. Sums of {[(7.1x 0.5) x (10m SF)] + [(7.2) x (100m SF)]} are divided by 2 for buffer condition score.

{[(____+____+____=____/30) x(10m SF)] + [(____+____+____=____/30)x (100m SF)]} / 2 =____

7.1(3 lowest) 7.2 (3 lowest)

Table 1. Slope Factor					
Determined by the percentage of bare ground on the dominant slope. First, select the steepness of the dominant slope. Then, select the percentage of bare ground from 7.1.1 for 10m buffer and 7.1.2 for the 100m buffer. The intersecting cell is the slope factor to be used in the Buffer Impact Index equation.					
10m Buffer	Percent Bare Ground in 10m Buffer				
	0	>0-5%	>5-15%	>15-25%	>25%
Flat <2%	1	.95	.80	.65	.50
Moderate 2-10%	1	.90	.70	.50	.30
Steep >10%	1	.85	.60	.35	.10
100m Buffer	Percent Bare Ground in 100m Buffer				
	0	>0-5%	>5-15%	>15-25%	>25%
Flat <2%	1	1	.90	.80	.70
Moderate 2-10%	1	.95	.80	.65	.50
Steep >10%	1	.90	.70	.50	.30
Comments:					

APPENDIX B

CONCEPTUAL WETLAND MITIGATION PLAN

JUNE 2007

View of Monroe and Barnes Reservoir on the Grand Mesa

INTRODUCTION

This conceptual plan proposes compensatory mitigation to replace aquatic resource functions that may be unavoidably lost or adversely affected as a result of implementation of the Proposed Action (reservoir enlargement) of this EIS. Section 3.5 of the Draft Environmental Impact Statement (DEIS) for the Enlargement of Hunter Reservoir outlines the Wetland Delineation performed by WestWater Engineering in 2004. The Jurisdictional Determination Request filed in November 2005 with the COE (WWE 2005b) confirmed the wetland boundary of wetlands in the proposed project area (Appendix C).

This conceptual plan describes potential mitigation sites considered to be reasonable and practicable by the EIS project team including Grand Mesa, Uncompahgre and Gunnison National Forests (GMUG) Grand Mesa Ranger District specialists, COE representatives and WestWater scientists. A combination of the identified mitigation projects would be capable of providing functional replacement of unavoidably lost wetlands. Guidance provided under the COE Regulatory Guidance Letter No. 02-2 (COE 2002) and related regulations was followed in designing this conceptual mitigation plan.

The Grand Mesa Wetland Function and Value Assessment (Grand Mesa Method) (WWE 2006b) was used to evaluate the wetland functions present at Hunter Reservoir and compare them to the potential wetland functions at the mitigation sites.

The Grand Mesa Method is intended as a tool for assessing existing wetland functions and wetland values on the Grand Mesa, Colorado, between 9,000 and 11,000 ft. in elevation (Appendix A). This tool provides experienced natural resource specialists a systematic, qualitative approach to scoring wetlands. This approach minimizes subjectivity by considering a wide range of potential functional conditions common to wetlands on the Grand Mesa in a consistent manner. The assessment provides a relative comparison of wetlands. It helps to determine whether wetland functions are diminished, and identify potential restoration or enhancement opportunities.

The Grand Mesa Method is comprised of basic site specific information followed by seven scoring indices, individually weighted as a percentage of the total score. Indices are weighted based on the relative importance of the individual index as determined by the EIS project team. The measure of function is indexed to the number of acres over which function is credited or debited (Appendix A). As described in the COE 2002 guidance, functional changes are referred to as Credits for increases in aquatic function at compensatory sites and Debits for losses at the project site (Table B-1).

Table B-1 first shows Hunter Reservoir and its associated values from the Grand Mesa Method to provide the basis of comparison to the potential mitigation sites. As discussed in Appendix A, the Function Value (FV) of Hunter Reservoir is high because of its large areas (46.5 acres).

Next, Table B-1 presents the change in the values in the Grand Mesa Method from the impacts of the proposed action. Hunter Reservoir has 46.5 acres of wetland.. The loss of value from the inundation of the existing 32 acres amounts to a debit of -16. The remaining 14.5 acres receive a credit from the Proposed Action of +0.6. An additional 2.8 acres of fringe wetland will be created by the Proposed Action, therefore increasing the value by +1.5. This results in a Total Functional Debit of -13.9 (-16 + 0.6 + 1.5 = -13.9).

Next, Table B-1 lists the potential compensatory mitigation sites. The weighted index values (WIV) listed represent the functional increase in value from proposed mitigation alternatives in contrast to their existing WIVs listed in Appendix A. Furthermore, the acreage represents the amount of wetland that will potentially result from mitigation. The Functional Credits associated with these sites are a product of the WIV increase multiplied by the resulting acreage. For example, Coon Creek Drainage currently has 14 acres of wetland and 28 acres of surface water as assessed in the Grand Mesa Method (Appendix A). Because the proposed mitigation on the site lowers the water level, the area used in the calculation of the Functional Credit is increased to 42 acres. The discussion below on Coon Creek Drainage provides additional details on the proposed mitigation.

Coon Creek Drainage and Monroe and Barnes Reservoir are 1891 easements. Full functional credit is given to these sites based on potentially relinquishing these water rights. The other sites do not have similar 1891 easements, and achieve functional credits by proposed improvements as described in the following site descriptions.

In conclusion, Table B-1 summarizes the functional assessment of the project site and potential mitigation sites with their corresponding scores and acreages. Based on the Grand Mesa Method, the conceptual mitigation projects identified could provide a functional credit ranging from 0.1 to 31.9 units depending upon the project or projects selected. This credit would be used to provide compensatory mitigation for the 13.9 Functional Value Debit that would occur under the Proposed Action. The proponent has agreed to provide compensatory mitigation to replace functions lost at the Proposed Action site. Selection of mitigation projects will be performed as part of the COE Individual Permit application.

Table B-1. Functional Assessment Summary

Site	Characteristics	Existing Weighted Index Value (per acre)	Existing Acreage	Functional Value	Comments
Hunter Reservoir	Wet Meadow, Fen, and Fringe Wetland	0.50	46.5	23.3	Current functional value of Hunter reservoir.
Proposed Action					
Site	**Characteristics**	**Existing Weighted Index Value**	**Existing Acreage**	**Functional Debits (-) plus Credits (+)**	**Comments**
Proposed Reservoir Impact	Wet Meadow, Fen, and Fringe Wetland	0.50	32	-16	Functional value lost from proposed action.
Residual Wetland Enhancement	Wet Meadow and Fringe Wetland	0.04	14.5	+0.6	Functional credit associated with functional gain in value to existing wetland from proposed action.
Wetland Fringe	Fringe Wetland	0.54	2.8	+1.5	Functional credit associated with fringe wetland developed along shoreline new reservoir water line.
			Functional Value Debit	-13.9	The total of the functional debit and credit reflects the net functional value loss of the Proposed Action.
Potential Compensatory Mitigation Sites					
Site	**Characteristics**	**Weighted Index Value Increase**	**Acreage**	**Functional Credits (+)**	**Comments**
Hunter Road Realignment	Wet Meadow and Fringe Wetland	0.15	6.0	+0.9	Functional credit created by removing road and reestablishing vegetation in riparian area. Grazing impact reduced by installing dead fall barriers or buck fences.
Coon Creek Drainage 1891 Easement	Wet Meadow, Fen, and Fringe Wetland	0.76	42.0	+31.9	Site with 1891 to be purchased by proponent. Located in Coon Creek drainage. Location not mapped due to proprietary issues. Functional credit created by relinquishment of easement in addition to improving conditions and lowering existing water levels to create approx. 20 acres of wetland and fen-like area. (14 acres enhanced existing plus 20 created acres plus 8 remaining acres of surface water)
Monroe & Barnes	Wet Meadow, Fen, and Fringe Wetland	0.86	13.8	+11.9	Functional credit created by release of easement in addition to improving existing wetland buffer conditions.
Elephant Head	Wet Meadow and Fen	0.12	5.6	+0.7	Functional credit created by removing ditches to restore hydrology and reestablishing vegetation.
Cooper's	Wet Meadow and Fen	0.01	4.9	+0.1	Functional credit created by removing ATV/ snowmobile route and reducing grazing access with dead fall barriers or buck fences.
Bingo	Wet Meadow and Fen	0.02	7.9	+0.2	Functional credit created by removing and re-vegetating road.
Upper West Leon Creek	Wet Meadow	0.23	8.0	+1.8	Functional credit created by installing check dams, enhancing current vegetation, and creating approx. 1.4 additional acres of wetland. (6.6 acres existing plus 1.4 acres created)

HUNTER ROAD REALIGNMENT

View toward Hunter Reservoir at road crossings in degraded wetland areas.

The Hunter Road Realignment area, consisting of 6 acres, is located at an elevation of 10,296 ft. (ASL), in Section 27, T. 11S., R. 93W., 6^{th} P.M.. This site is located just north of Hunter Reservoir (Figure B-1).

This area is approximately a one-mile section of the existing access road to Hunter Reservoir. Multiple stream crossings have heavily impacted the riparian wetland along an un-named tributary of East Leon Creek. In addition, poor road conditions have caused motorists to create alternate routes around muddy potholes increasing the impacted area within the corridor. Voids in vegetation have increased erosion and sedimentation into the nearby stream.

Potential Mitigation

The Proponent would realign the existing road out of the wetland area and reduce the stream crossings to only one near the northern most segment of this section. The former road would be graded and re-vegetated. Grazing would possibly decrease as the animals would follow the new, more accessible route and barrier fences will keep cattle out of restored wetlands.

The existing value according to the Grand Mesa Method is 0.58 per acre. Enhancement and road relocation would increase functional value 0.15 per acre. Functional credit gained by enhancing this 6 acre site and relocating the road is 0.9 (Table B-1).

COON CREEK DRAINAGE 1891 EASEMENT

View to west of Coon Creek Drainage Reservoir.

Coon Creek Drainage 1891 Easement covers approximately 42 acres located at an elevation of 10,787 ft. (ASL) in Section 27, T. 11S., R. 95W., 6th P.M.. This site is located 12.1 miles west of Hunter Reservoir (Figure B-1). A private party holds the 1891 easement for this reservoir site.

This site is a relatively high quality wetland/fen-like site (see photo above). It has 14 acres of existing wetland with 28 acres of open water. An ATV track accesses an earthen dam that impounds water. The open water is flooding potential wetland/fen-like area.

Potential Mitigation

The project Proponent would purchase the 1891 easement from the private party and then relinquish it to the Forest Service. This would protect the area from any future development. The Proponent would lower the water level by removing or reducing the size of the dam, which would expose approximately 20 additional acres of potential wetland area. The proponent would re-vegetate the newly established wetland area, remaining dam structure and access road, increasing the value of existing wetlands and 10-meter buffer along with creating new wetland acreage.

The existing functional value is relatively high at 0.71 per acre. Enhancement and protection would increase functional value 0.05 per acre. Functional credit gained by protecting this 42 acre site and creating additional wetland acreage is 31.9 (Table B-1).

MONROE AND BARNES.

View across the high quality fen at Monroe and Barnes.

Monroe and Barnes covers approximately 13.8 acres at an elevation of approximately 10,019 ft (ASL) in Section 30, T. 11S., R. 95W., 6^{th} P.M.. This site is 15.2 miles west of Hunter Reservoir (Figure B-1). Monroe and Barnes is a reservoir authorized by an 1891 easement held by the Proponent.

Monroe and Barnes includes a high quality, diverse wetland and fen area (photo above and cover photo). Because the Proponent owns the existing rights associated with this site, potential future development threatens long term existence of this wetland.

Proposed Mitigation

The Proponent would relinquish its 1891 easement to the Forest Service in order to ensure the long-term protection of this site. The water level behind the existing dam could be lowered about 2 feet reducing surface water area and slightly increasing the amount of wetland habitat. The existing dam structure would be treated for invasive plant species and noxious weeds and re-vegetated.

The existing functional value is relatively high at 0.83 per acre. Enhancement and protection would increase functional value 0.03 per acre. Functional credit gained by enhancing and protecting this site is 11.9 (Table B-1).

ELEPHANT HEAD

View of ditch channeling water away from fen area.

Elephant Head Fen is approximately 5.6 acres located at an elevation of 10,285 ft (ASL) in Section 14, T. 11S., R. 95 W., 6th P.M.. This site is 5.1 miles west northwest of Hunter Reservoir (Figure B-1).

Currently, this area contains several man-made ditches that channel spring water away from the existing wetland and fen area. The diversion of the natural wetland hydrology has degraded wetland vegetation quality, diversity, and structure.

Proposed Mitigation

The Proponent would remove the ditches in the area to restore the hydrology across the wetland/fen area. Removal of the man-made ditches would disperse flow which would enhance the existing wetland/fen vegetation and create a more diverse hydrophytic plant community.

The existing functional value according to the Grand Mesa Method is at 0.45 per acre. Enhancement would increase functional value 0.12 per acre. Functional credit gained by restoring the hydrology to the existing 5.6 acres is 0.7 (Table B-1).

COOPER'S

View to the west at ATV-Snowmobile route across fen area.

Cooper's Fen covers approximately 4.9 acres located at an elevation of 10,285 ft. (ASL) in Section 14, T. 11S., R. 94W., 6^{th} P.M.. This site is 5.5 miles west-northwest of Hunter Reservoir (Figure B-1).

Currently, this site is a high quality fen with floating mat and sphagnum moss. The site has an ATV track used to maintain the snowmobile route that cuts through the center of the area (see photo above). Heavy grazing and an additional track along its eastern fringe has caused erosion and degraded the wetland/fen buffer area.

Proposed Mitigation

The Proponent in cooperation with the Forest Service would relocate the snowmobile and ATV route outside the wetland and 10 meter buffer area. Forest deadfall barriers or buck fences would be placed to limit access to the wetland/fen and surrounding 10 meter buffer to reduce grazing impacts.

The existing value according to the Grand Mesa Method is at 0.75 per acre. Relocation of the snowmobile route and restoration of the all terrain vehicle (ATV) service access along with the reduction of grazing access would increase functional value 0.01 per acre. Functional credit gained by these improvements to the existing 4.9 acres would be a minimum of 0.1 (Table B-1).

BINGO

View to the north towards the logging access road that runs east-west below the tree line adjacent to the fen area.

Bingo Fen covers approximately 7.9 acres located at an elevation of 10,202 ft. (ASL) in Section 21, T. 11S., R. 94W., 6th P.M.. This site is located 6.7 miles west of Hunter Reservoir (Figure B-1).

Currently, this site is a flat open wetland/fen with a timber sale access road on the north boundary along the tree line (see photo above). There is also an old skid trail bordering the wetland on its northern edge.

Proposed Mitigation

The Proponent in cooperation with the FS would remove and re-vegetate the timber sale access road, which would increase the value of the wetland 10 meter buffer and slightly increase the wetland area. The Proponent will also contour the old skid trail and re-vegetate it as well.

The existing value according to the Grand Mesa Method is at 0.58 per acre. Removal of the timber sale access road and the skid trail would increase functional value 0.02 per acre. Functional credit gained by these improvements would be a minimum of 0.2 (Table B-1).

UPPER WEST LEON CREEK

View of entrenched stream and degraded wetland area.

Upper West Leon Creek area covers approximately 6.6 acres located at an elevation of 10,115 ft. (ASL), in Section 20, T. 11S., R. 93W., 6th P.M.. This site is located 2.1 miles northwest of Hunter Reservoir (Figure B-1).

Currently, this site is an open meadow that has been impacted by grazing, reducing vegetation diversity and structure (see photo above). As a result, the creek has entrenched, which has deprived the site of water and reduced wetland hydrology.

Potential Mitigation

The Proponent would install check dams to impound water in the currently flowing waterways. This would disperse the water throughout the area. After check dams are in place, increased water levels will enhance the re-vegetation of the area. Enhanced structure and diversity of vegetation will increase the existing wetland value. Additionally, this would create approximately 1.4 acres of wetland. Grazing impacts will be decreased by changing fence alignment and eliminating 2 access gates down stream, reducing accidental introduction of domestic livestock.

The existing value according to the Grand Mesa Method is 0.48 per acre. Enhancement and protection would increase functional value 0.23 per acre. Functional credit gained by enhancing this site and creating additional wetland acreage is 1.8 (Table B-1).

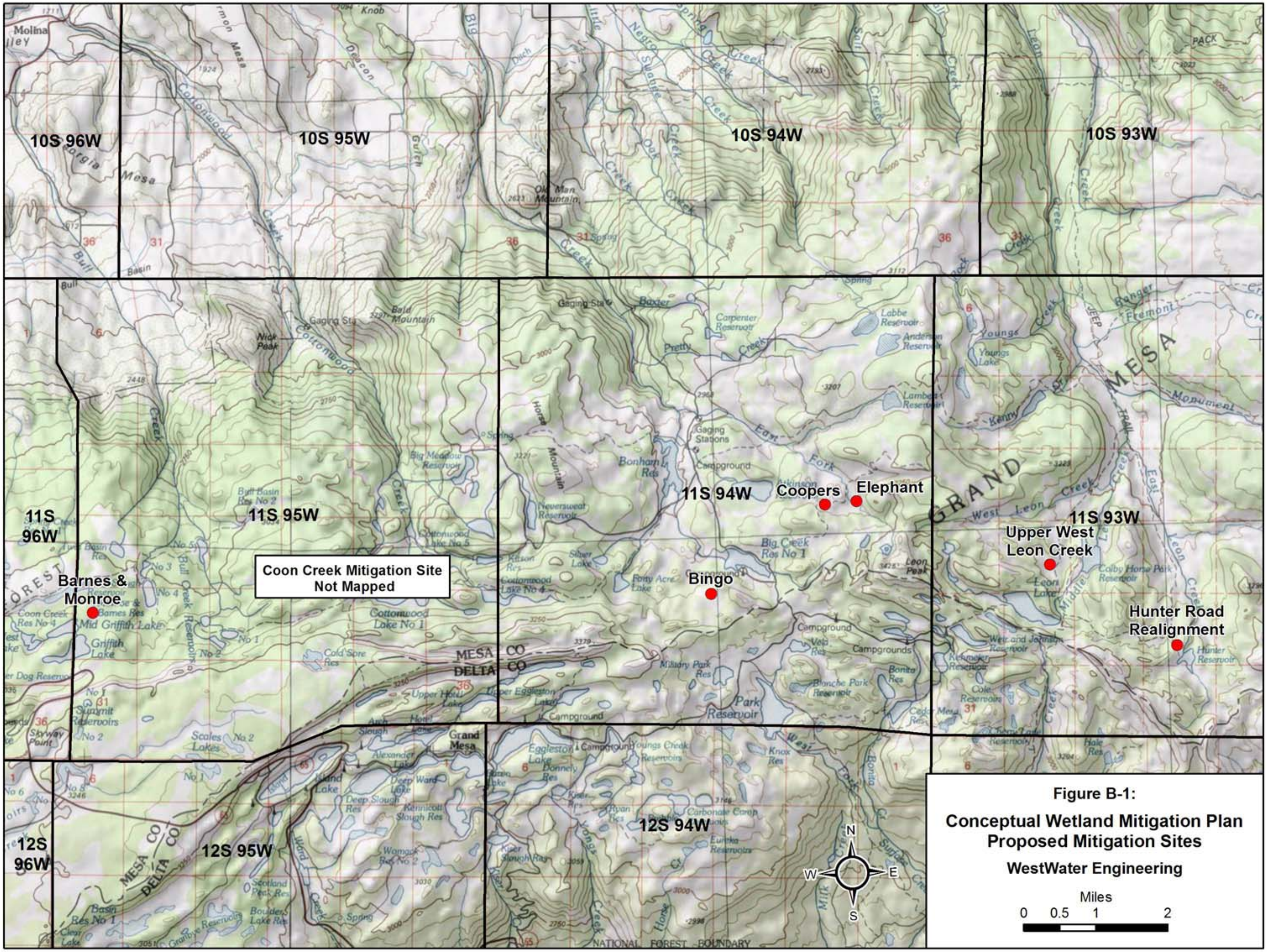


Figure B-1:

Conceptual Wetland Mitigation Plan
Proposed Mitigation Sites

WestWater Engineering

APPENDIX C

HYDROLOGIC DATA

JUNE 2007

Section 3.3, in this Environmental Impact Statement (EIS), describes the hydrology in the area of the Proposed Action. Table C-1 is data from the Leonard Rice Study provided in the GEI 2002 report, which was the Hunter Reservoir hydrologic analysis performed during initial engineering studies. The data has been used in this EIS for the estimated average natural and modified discharge of East Leon Creek, the hydrograph and the estimated groundwater re-charge. Table C-1 also provides data to predict the size and occurrence of the proposed new operational discharges. The data estimates the end of the month storage in Hunter Reservoir, natural flow in East Leon Creek, flows with storage and releases at Hunter Reservoir, and natural flow on East Leon Creek above the confluence with Middle Leon Creek.

Also provided in this Appendix is a summary of the 2006 WestWater Field Observations and Baseline Study (Page C-7).

Table C-1. From Ute Water, April 2006

Estimated Natural Flow at Hunter Reservoir per Leonard Rice Engineering (af) (October 14, 2002)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	**Total**
1953	155	111	100	108	106	125	133	280	506	492	326	128	2570
1954	129	108	91	84	80	101	154	325	330	322	249	96	2069
1955	133	108	68	66	51	70	133	291	409	429	319	133	2210
1956	131	92	90	68	83	109	129	318	397	303	217	90	2027
1957	109	91	60	63	80	76	122	299	677	618	618	487	3300
1958	97	123	101	96	85	105	136	451	477	356	293	132	2452
1959	129	98	77	73	69	125	120	299	518	411	246	158	2323
1960	97	162	116	97	92	139	138	286	488	440	209	160	2424
1961	129	116	104	94	84	131	130	284	462	410	235	264	2443
1962	97	188	134	105	92	390	167	345	532	554	251	162	3017
1963	95	100	85	71	70	645	152	232	392	350	252	192	2636
1964	129	114	96	94	84	171	125	335	467	474	324	160	2573
1965	129	96	87	78	73	120	128	310	557	576	285	202	2641
1966	97	145	121	105	93	158	132	290	392	368	189	134	2224
1967	95	115	91	82	79	250	154	245	462	531	266	207	2577
1968	95	128	102	90	92	157	125	305	559	491	354	168	2666
1969	95	106	100	97	94	71	145	300	415	492	212	173	2300
1970	95	127	109	107	100	37	124	420	524	507	241	191	2582
1971	97	138	117	106	93	371	143	282	555	529	353	204	2988
1972	95	111	93	88	85	579	149	250	496	388	221	205	2760
1973	95	136	109	102	89	51	108	404	522	557	395	176	2744
1974	95	131	105	98	89	206	133	299	482	445	231	135	2449
1975	132	119	96	89	81	30	98	320	571	602	274	151	2563
1976	140	107	94	83	74	80	115	294	469	456	218	165	2295
1977	140	105	79	68	64	90	127	140	306	313	278	158	1868
1978	140	136	96	72	69	238	140	289	554	589	194	181	2698
1979	123	91	88	86	77	129	115	341	541	538	358	178	2665
1980	119	101	99	88	80	78	116	343	494	483	286	138	2425
1981	87	101	91	76	64	53	145	235	357	372	251	133	1965

Table C-1. From Ute Water, April 2006

Estimated Natural Flow at Hunter Reservoir per Leonard Rice Engineering (af) (October 14, 2002)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	**Total**
1982	74	115	104	94	84	79	112	323	734	556	289	244	2808
1983	203	162	129	110	92	85	117	397	653	666	356	223	3193
1984	107	141	126	113	103	90	128	569	569	586	434	264	3230
1985	140	165	134	116	101	108	162	488	467	453	341	166	2841
1986	140	134	111	102	92	107	145	439	512	561	277	205	2825
1987	140	149	134	114	99	97	143	427	421	353	374	132	2583
1988	72	112	84	86	84	98	124	264	351	406	254	142	2077
1989	112	103	92	83	72	87	141	256	302	393	271	140	2052
1990	140	100	96	95	82	82	147	198	349	431	251	138	2109
1991	140	109	74	78	79	72	117	306	403	419	336	176	2309
1992	126	120	104	93	85	88	136	333	340	420	341	161	2347
1993	120	111	98	87	83	84	107	533	525	544	377	191	2860
1994	154	121	108	102	93	91	135	328	318	341	301	154	2246
1995	130	108	91	90	91	86	128	375	614	674	371	197	2955
1996	173	149	110	98	94	113	135	349	354	546	312	227	2660
1997	119	130	102	99	83	209	186	705	1063	441	619	490	4246
1998	250	168	129	117	101	290	246	770	586	736	539	273	4205
1999	156	145	97	87	103	182	98	229	336	402	634	386	2855
2000	135	113	102	91	95	175	178	178	71	168	179	122	1607
	124	122	101	91	85	148	136	339	477	469	313	189	2593
	2.01	2.05	1.63	1.49	1.53	2.41	2.28	5.52	8	7.62	5.08	3.18	

<u>Estimated End of Month Storage in Hunter Reservoir (Nov 1 Storage =0)</u>

									<u>Reservoir Fills?</u>
1953	55.5	156	264	370	495	628	908	1340	Yes
1954	54	145	229	309	410	564	889	1219	No
1955	54	122	188	239	309	442	733	1142	No
1956	46	136	204	287	396	525	843	1240	No
1957	45.5	106	169	249	325	447	746	1340	Yes

	Estimated End of Month Storage in Hunter Reservoir (Nov 1 Storage =0)								**Reservoir Fills?**
1958	61.5	163	259	344	449	585	1036	1340	Yes
1959	49	126	199	268	393	513	812	1330	No
1960	81	197	294	386	525	663	692	692	No
1961	58	162	256	340	471	601	692	692	No
1962	94	228	333	425	815	982	1327	1340	Yes
1963	50	135	206	276	692	692	692	692	No
1964	57	153	247	331	502	627	692	692	No
1965	48	135	213	286	406	534	844	1340	Yes
1966	72.5	194	299	392	550	682	972	1340	Yes
1967	57.5	149	231	310	560	692	692	692	No
1968	64	166	256	348	505	630	935	1340	Yes
1969	53	153	250	344	415	560	860	1275	No
1970	63.5	173	280	380	417	541	961	1340	Yes
1971	69	186	292	385	756	899	1181	1340	Yes
1972	55.5	149	237	322	692	692	692	692	No
1973	68	177	279	368	419	527	931	1340	Yes
1974	65.5	171	269	358	564	697	996	1340	Yes
1975	59.5	156	245	326	356	454	774	1340	Yes
1976	53.5	148	231	305	385	500	794	1263	No
1977	52.5	132	200	264	354	481	621	692	No
1978	68	164	236	305	543	683	972	1340	Yes
1979	45.5	134	220	297	426	541	882	1340	Yes
1980	50.5	150	238	318	396	512	855	1340	Yes
1981	50.5	142	218	282	335	480	692	692	No
1982	57.5	162	256	340	419	531	854	1340	Yes
1983	81	210	320	412	497	614	1011	1340	Yes
1984	70.5	197	310	413	503	631	1200	1340	Yes
1985	82.5	217	333	434	542	704	1192	1340	Yes
1986	67	178	280	372	479	624	1063	1340	Yes
1987	74.5	209	323	422	519	662	1089	1340	Yes
1988	56	140	226	310	408	532	692	692	No

Estimated End of Month Storage in Hunter Reservoir (Nov 1 Storage =0)

									Reservoir Fills?
1989	51.5	144	227	299	386	527	692	692	No
1990	50	146	241	323	405	552	692	692	No
1991	54.5	129	207	286	358	475	692	692	No
1992	60	164	257	342	430	566	899	1239	No
1993	55.5	154	241	324	408	515	1048	1340	Yes
1994	60.5	169	271	364	455	590	918	1236	No
1995	54	145	235	326	412	540	915	1340	Yes
1996	74.5	185	283	377	490	625	974	1328	No
1997	65	167	266	349	558	744	1340	1340	Yes
1998	84	213	330	431	721	967	1340	1340	Yes
1999	72.5	170	257	360	542	640	869	1205	No
2000	56.5	159	250	345	520	698	876	947	No
Average	61	162	253	338	477	606	897	1151	25
Inflow (cfs)	1.03	1.63	1.49	1.39	2.26	2.10	4.73	4	

Estimated Natural Flow in East Leon Creek (cfs)

Natural Flow	13.65	13.94	11.10	10.10	10.42	16.36	15.51	37.47	54	51.78	34.53	21.63

Estimated Flows with Storage and Releases at Hunter Reservoir (cfs)

Modified Flow	18.90	12.91	9.47	8.62	9.03	14.10	13.41	32.74	50	57.03	39.78	26.88

Estimated Natural Flow in East Leon Creek (af) above Confluence with Middle Leon Creek

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1953	1053	754	679	734	720	849	904	1902	3438	3343	2215	870
1954	876	734	618	571	544	686	1046	2208	2242	2188	1692	652
1955	904	734	462	448	346	476	904	1977	2779	2915	2167	904
1956	890	625	611	462	564	741	876	2160	2697	2059	1474	611

Estimated Natural Flow in East Leon Creek (af) above Confluence with Middle Leon Creek

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1957	741	618	408	428	544	516	829	2031	4600	4199	4199	3309
1958	659	836	686	652	577	713	924	3064	3241	2419	1991	897
1959	876	666	523	496	469	849	815	2031	3519	2792	1671	1073
1960	659	1101	788	659	625	944	938	1943	3315	2989	1420	1087
1961	876	788	707	639	571	890	883	1929	3139	2786	1597	1794
1962	659	1277	910	713	625	2650	1135	2344	3614	3764	1705	1101
1963	645	679	577	482	476	4382	1033	1576	2663	2378	1712	1304
1964	876	775	652	639	571	1162	849	2276	3173	3220	2201	1087
1965	876	652	591	530	496	815	870	2106	3784	3913	1936	1372
1966	659	985	822	713	632	1073	897	1970	2663	2500	1284	910
1967	645	781	618	557	537	1699	1046	1665	3139	3608	1807	1406
1968	645	870	693	611	625	1067	849	2072	3798	3336	2405	1141
1969	645	720	679	659	639	482	985	2038	2820	3343	1440	1175
1970	645	863	741	727	679	251	842	2853	3560	3445	1637	1298
1971	659	938	795	720	632	2521	972	1916	3771	3594	2398	1386
1972	645	754	632	598	577	3934	1012	1699	3370	2636	1501	1393
1973	645	924	741	693	605	346	734	2745	3546	3784	2684	1196
1974	645	890	713	666	605	1400	904	2031	3275	3023	1569	917
1975	897	808	652	605	550	204	666	2174	3879	4090	1862	1026
1976	951	727	639	564	503	544	781	1997	3186	3098	1481	1121
1977	951	713	537	462	435	611	863	951	2079	2127	1889	1073
1978	951	924	652	489	469	1617	951	1963	3764	4002	1318	1230
1979	836	618	598	584	523	876	781	2317	3676	3655	2432	1209
1980	808	686	673	598	544	530	788	2330	3356	3282	1943	938
1981	591	686	618	516	435	360	985	1597	2425	2527	1705	904
1982	503	781	707	639	571	537	761	2194	4987	3777	1963	1658
1983	1379	1101	876	747	625	577	795	2697	4436	4525	2419	1515

Estimated Natural Flow in East Leon Creek (af) above Confluence with Middle Leon Creek

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1984	727	958	856	768	700	611	870	3866	3866	3981	2949	1794
1985	951	1121	910	788	686	734	1101	3315	3173	3078	2317	1128
1986	951	910	754	693	625	727	985	2983	3479	3811	1882	1393
1987	951	1012	910	775	673	659	972	2901	2860	2398	2541	897
1988	489	761	571	584	571	666	842	1794	2385	2758	1726	965
1989	761	700	625	564	489	591	958	1739	2052	2670	1841	951
1990	951	679	652	645	557	557	999	1345	2371	2928	1705	938
1991	951	741	503	530	537	489	795	2079	2738	2847	2283	1196
1992	856	815	707	632	577	598	924	2262	2310	2853	2317	1094
1993	815	754	666	591	564	571	727	3621	3567	3696	2561	1298
1994	1046	822	734	693	632	618	917	2228	2160	2317	2045	1046
1995	883	734	618	611	618	584	870	2548	4172	4579	2521	1338
1996	1175	1012	747	666	639	768	917	2371	2405	3710	2120	1542
1997	808	883	693	673	564	1420	1264	4790	7222	2996	4205	3329
1998	1699	1141	876	795	686	1970	1671	5231	3981	5000	3662	1855
1999	1060	985	659	591	700	1237	666	1556	2283	2731	4307	2622
2000	917	768	693	618	645	1189	1209	1209	482	1141	1216	829
Average (af)	839	829	683	621	579	1006	923	2304	3238	3184	2123	1287
Average (cfs)	13.65	13.94	11.10	10.10	10.42	16.36	15.51	37.47	54.42	51.78	34.53	21.63
Natural Flow	13.65	13.94	11.10	10.10	10.42	16.36	15.51	37.47	54.42	51.78	34.53	21.63
Modified Flow	18.90	12.91	9.47	8.62	9.03	14.10	13.41	32.74	50.30	57.03	39.78	26.88

Summary of 2006 WestWater Field Observations and Baseline Study

I. INTRODUCTION

During the review of the Preliminary Draft EIS, the Forest Service (FS) identified the need to establish baseline conditions of East Leon Creek's existing channel geometry prior to completion of the proposed project. The Forest Service concern is whether sustained flow above ordinary high water (bankfull) may have the propensity to increase sediment entrainment and saturation of stream bank and bed material and consequentially increase channel instability.

Therefore, the intent of this investigation was to analyze several cross sections of the creek to determine what, if any, effect the enlargement of Hunter Reservoir might have on the hydrologic processes of East Leon Creek below Hunter Creek. First, in order to understand the hydrological regime of the watershed and how it is manifested in stream flow, the Rosgen method was used at each location (Rosgen 1994, 1996). The Rosgen method provides a general physical characterization of stream channels for general assessment of the watershed. Flow patterns in any given stream system may be an important factor in fisheries management, flood protection, recreational uses, and water supply uses.

Channel monitoring sites (cross sections) were established along identified stream reaches to assess existing stream variables in order to classify East Leon Creek according to Rosgen. These data (Table C-2) can be used to assess stream geomorphological response to proposed water release (discharge) of up to 10 cfs. The proposed discharge is less than the estimated maximum of approximately 23 cfs for May natural peak flows (without impoundment).

In the summer of 2006, WestWater biologists and hydrologists conducted stream surveys on five cross sections on East Leon Creek below Hunter Reservoir. The five cross sections were chosen at intervals to capture the incremental influences of each tributary to East Leon Creek before the confluence with Middle Leon Creek (see Figure C-1). Cross sections were located on riffles or runs except the first cross section below the existing dam. This location (XS-1) was located on a step between pools due to its stream channel type described in the paragraphs below. Over all, the channel between Kirkendall Dam and Middle Leon Creek is dominated by run rather than riffle and pool (see Glossary).

II. METHODS AND ANALYSIS

The geometry of the cross sections was measured at all locations including width, depth, velocity, slope, estimate of bed and bank material composition, percent of free matrix of bed material, temperature, and flood prone area and flood prone area width (Rosgen 1996).

Permanent steel rods were placed on the left and right bank of the cross section above flood prone width. Cross sectional geometry was obtained using a taunt, level mason's string line across each cross section perpendicular to the stream channel for elevation at each data point with a separate surveyor's tape for horizontal distance of each data point.

Depth of the channel was determined with a wading rod at intervals ranging from 6 in. to 1 ft, depending on the depth and width of the channel. The thalweg (maximum depth at bankfull) was measured and documented, as well as bankfull width and depth. Bankfull depth was determined in the field using common methods such as sediment deposition zones and particle size, bank rock staining, lichen growth, and stream bank vegetation root crown development and growth. Flood stage (or flood prone area and width) was determined in the field using twice the maximum depth at bankfull stage and calculating flood prone area width. Due to the geomorphology of the locations, streambed and bank material was easily distinguished. Most of the alluvium was boulder and cobble size classes (boulder = >20 in., cobble = 2.5-10 in., gravel = 0.08 - 2.5 in., sand/silt = <0.08 in.). Discharge for bankfull and flood stage was determined through WINXS Pro, an FS modeling application for streams, as provided in Table C-3 (USDA-FS 2005).

III. RESULTS

Please refer to Figure C-1, page C-19, for locations of cross sections XS-1 through XS-5. Field measurements are provided in Table C-2 and modeling results in Table C-3. Photos of cross sections are attached for reference.

XS 1

This location was selected to be as close to Kirkendall dam as possible, above the first tributary confluence but in the natural channel undisturbed by past construction activities. This site was sampled on July 17, 2006. Late afternoon water temperature was 68° F. Channel geomorphology is classified as Rosgen stream type A2 (high-gradient, boulder-controlled channel) as can be seen in Photos 1-4. With a step-pool configuration, this channel reach was measured at the crest of the step. Photo 4 illustrates the steep slope at this section.

Bank erosion risk was estimated to be low and comprised of 90% boulders (>256 mm) and 10% cobbles (64-256 mm). Heavy willow (*Salix* spp.) establishment was noted at this location. Stream bed free matrix particles (those lying on the surface and not embedded) consisted of a relatively low amount of free matrix cobble (Photo 1). The boulder-cobble substrate was embedded and the channel is entrenched. The source of silt at this cross section was not evident but is possibly due to sediment discharged from the reservoir when the gate is opened and the reservoir is drained.

XS 2

This location is directly below the confluence of the first mapped tributary approximately 2,442 ft northeast of XS- 1. Data was collected mid-morning July 18, 2006. Water temperature was 64° F.

The tributary was estimated to be flowing at 20-40% of the total discharge of East Leon Creek at the time of survey. Natural channel classification after Rosgen (1994) is a milder gradient than XS1 and classified as B2, as it is moderately entrenched with some B3 characteristics (see Photos 5 – 8) Erosion risk is low, with banks dominated by cobble, boulder and gravel and dense, rooted vegetation. The stream bed was moderately embedded and free matrix particles were 95% cobble and 5% gravel. Silty sediment was found to be covering more of the stream bed. The intermittent tributary was 90% free matrix composed of 95% gravel and no silt or sandy sediment.

Photo 6 shows an area of silt and sand in the flood prone area. It is unclear how much of this silty-sandy area was due to mass wasting and livestock grazing. Along with up-stream mass wasting, effects of grazing by livestock were apparent in this part of the watershed.

XS-3

The location was sampled on July 27, 2007. Mid-day temperature was 63.5° F. Stream channel type is B3 with moderate entrenchment and gradient (See Photos 9-12). Riffle stream bed particles are 70% cobble and 30% gravel with free matrix particles making up 85% of the bed. Bank vegetation was dense and comprised primarily of willow. Fish were observed first at this station.

Erosion potential is low with a boulder substrate. Dense willow establishment was noted in the flood prone area. A small (less than 10 ft) of stream bank is eroded apparently due to crossing by livestock and big game.

XS-4

This location was sampled on July 27, 2007. Water temperature remained 63.5° F. XS-4 was classified as a B3 channel (Rosgen 1996) with less entrenchment but still moderately entrenched. The stream bed was primarily cobble sized rock with a few boulders as can clearly be seen in Photo 16. The stream bed is slightly embedded with 75% free matrix particles of cobble. Erosion potential is low with a high degree of rooted terrestrial vegetation composed of willow and spruce (*Picea* spp.) and a boulder substrate. Silt deposition was low.

XS-5

This location was sampled on July 27, 2007. Water temperature remained 63.5° F. XS-5 is located just downstream of the confluence at the head of Leon Creek. This B3 channel is slightly entrenched and over-story vegetation is changing to mature spruce and more robust, taller willow as can be seen in Photos 18 - 21. Erosion potential is low with 100% boulder-cobble-vegetation banks. Stream bed free matrix particles are 50% of channel and composed equally of cobble and gravel. Silt was not present.

IV. DISCUSSION

While East Leon Creek must have been hydrologically altered by Hunter Reservoir since 1912, it maintained stream stability, showing little to no headcutting or streambank erosion. Sediment deposition was relatively heavy at XS-1, XS-2 and XS-3 compared to expectations. This may be a result of sediment discharged from the reservoir when it is drained. Cementation by silt or clay sediment appears to be minimal. Flows resulting from the increase in storage capacity of Hunter Reservoir would likely be relatively similar in the area directly below the dam during the early spring while the headgate is closed to capture runoff. During release periods, runoff will be close to 5 cfs but probably remain at 10 cfs for sustained periods of time when demand for water is possible. This sustained flow is greater than the typical base flow in East Leon Creek; however, it is well below the estimated average of 23 cfs peak flows in May (pre-impoundment). It is unlikely that the higher sustained flows would create increased erosion and stream bank instability on East Leon Creek.

V. CONCLUSIONS AND RECOMMENDATIONS

Hydrologic alteration of East Leon Creek resulting from the increased capacity of Hunter Reservoir would not likely cause any significant changes in channel stability or excessive discharges compared to the current hydrologic regime. When storage reduces natural discharge, subsequent releases for augmentation will be sufficient to provide flushing of sediment accumulated during storage. It is recommended that monitoring be conducted to document changes, if any.

Hydrologic alteration of East Leon Creek resulting from the increased capacity of Hunter Reservoir would not likely cause any significant changes to the current hydrologic regime. Hydrologic monitoring and modeling could be conducted before modification of the dam to further understand how the operation and maintenance of the new dams would affect flows in East Leon Creek. Monitoring could include flow monitoring, precipitation measurements, and repeated measurements of the five cross sections established herein.

VI. REFERENCES

ROSGEN, D. L. 1994. A classification of natural rivers. Catena, 22:169-199. Elsievier Science, Amsterdam.

ROSGEN, D. L. 1996. Applied river morphology. Wildland Hydrology, Pagosa Springs, Colorado.

USDA-FS. 2005. WinXSPRO, a channel cross section analyzer, user's manual, v.3.0. U.S. Department of Agriculture, U.S. Forest Service. Rocky Mountain Research Station General Technical Report RMRS-GTR-147.

Photo 1. XS1 from downstream

Photo 2. XS1 stream bed material at next step downstream

Photo 3. XS1 from left bank to right

Photo 4. XS1 from upstream looking down.

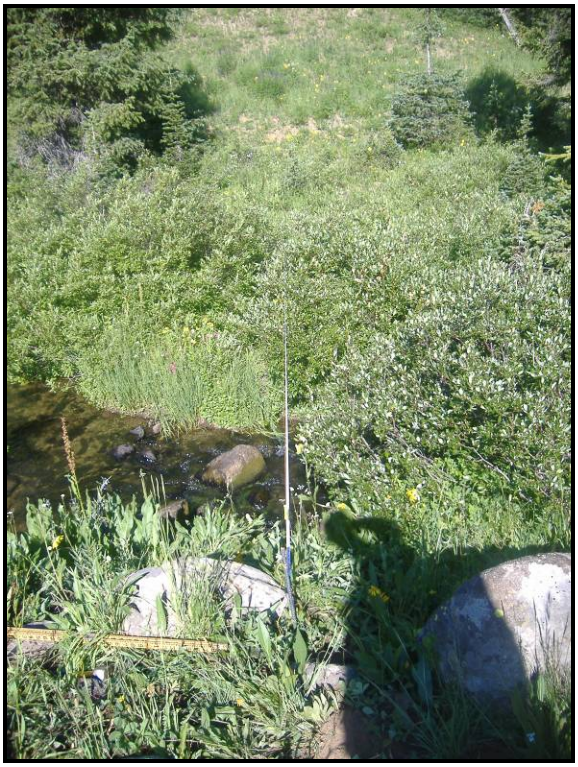


Photo 5. XS2 from right to left bank

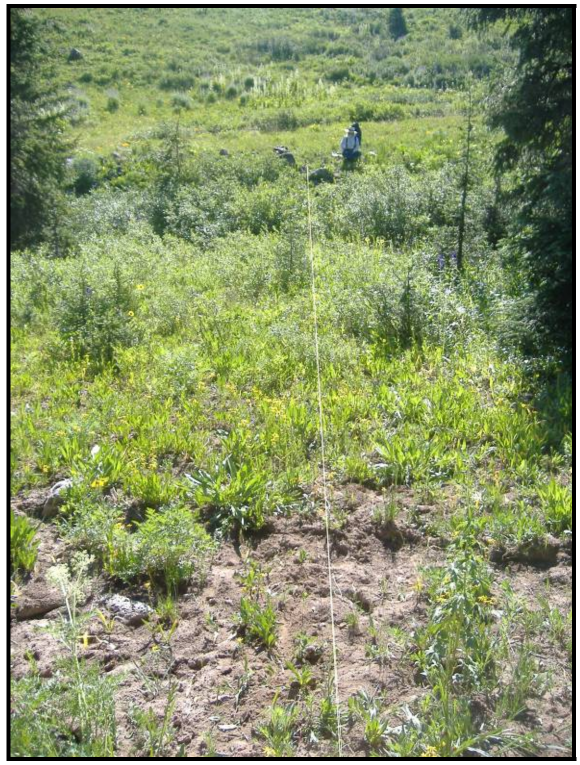


Photo 6. XS2 from left to right bank

Photo 7. XS2 downstream run below section

Photo 8. XS2 from downstream

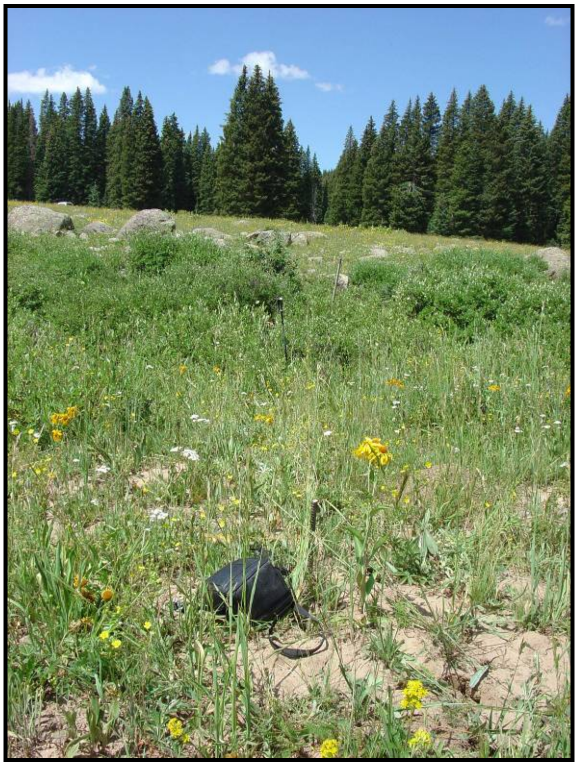


Photo 9. XS3 right to left bank

Photo 10. XS3 left to right bank

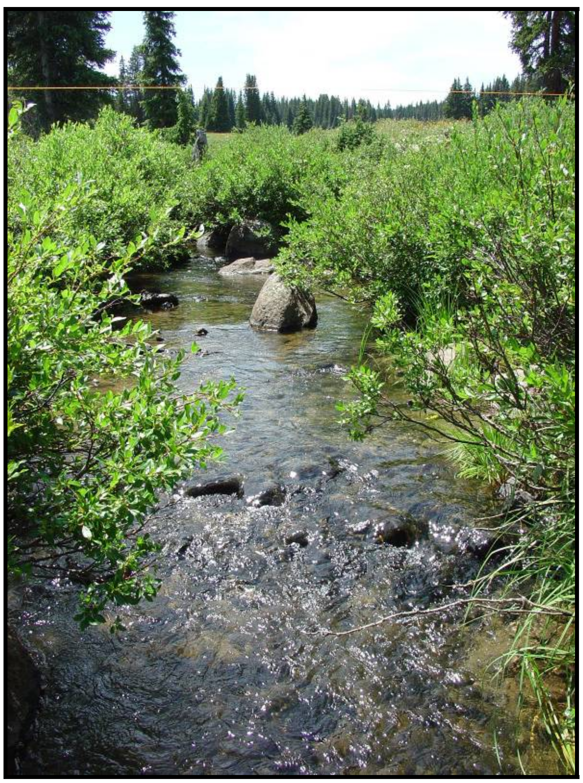


Photo 11. XS3 from below riffle

Photo 12. XS3 from upstream

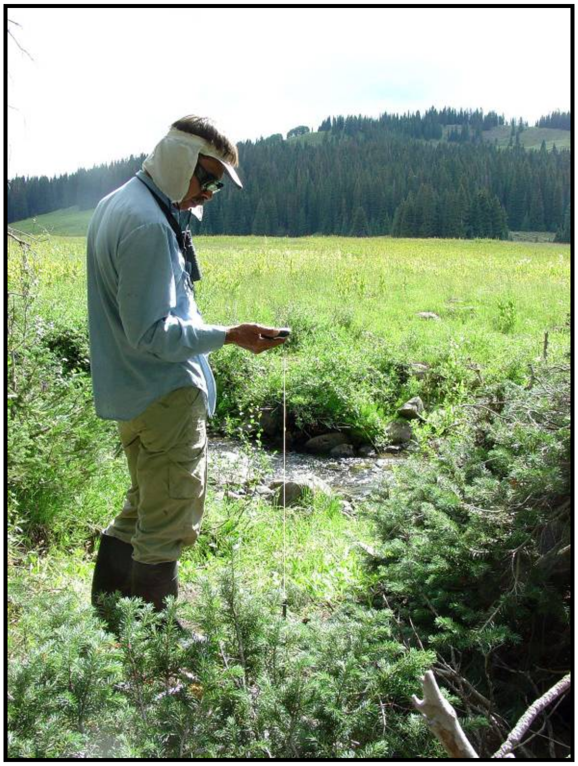


Photo 13. XS4 right to left bank

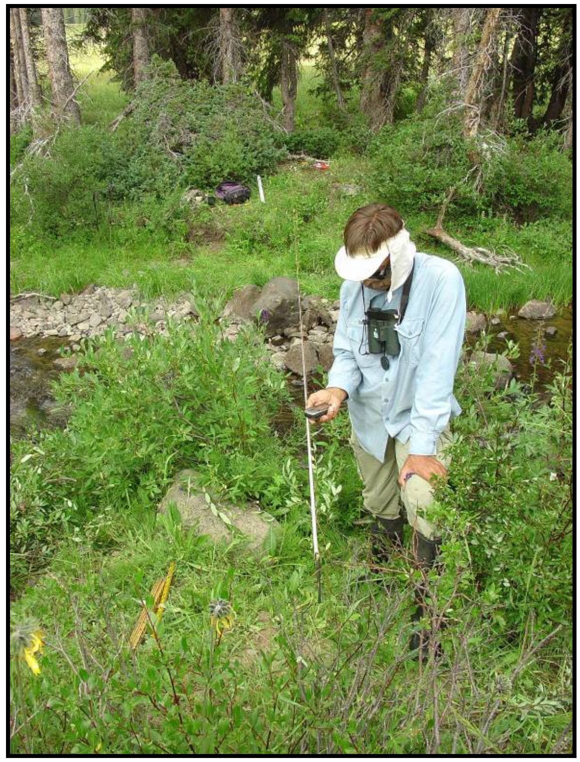


Photo 14. XS4 Left to right bank

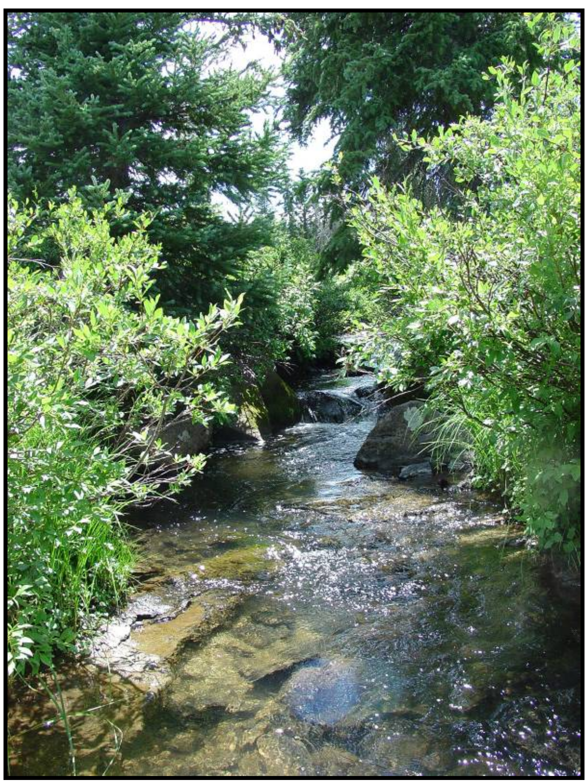


Photo 15. XS 4 looking upstream

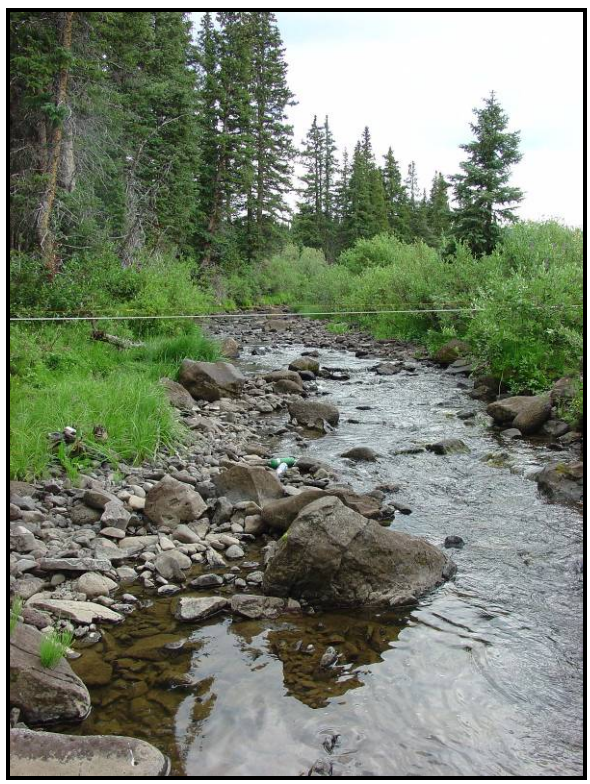


Photo 16. XS4 from downstream

Photo 17. XS5 from right to left bank

Photo 18. XS 5 from upstream

Photo 19. XS 5 from left to right bank

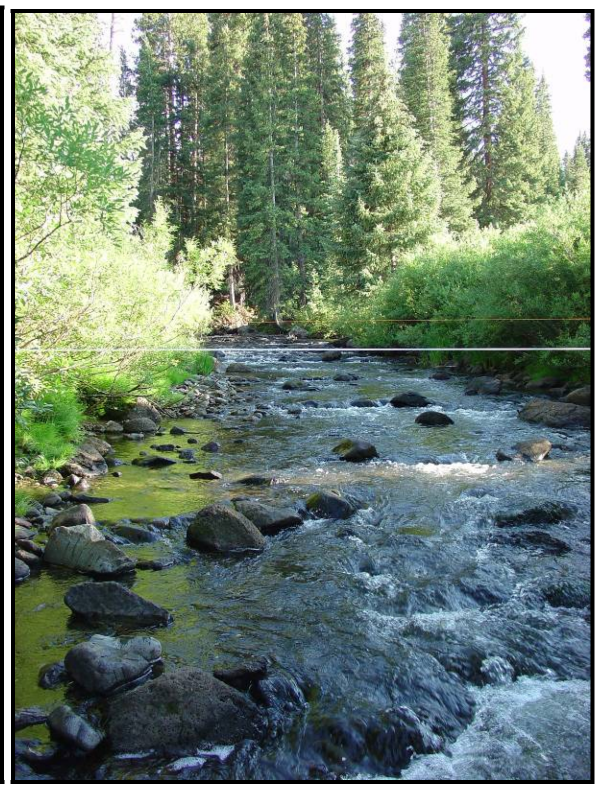


Photo 20. XS 5 from downstream

Table C-2. East Leon Creek unprocessed cross section data

XS1, slope=10%, v=3 ft/sec, WSE=7.24		XS2, slope=5.5%, v=1.92 ft/sec, WSE=5.77		XS3, slope=4%, v=1.28 ft/sec, WSE=4.92		XS4, slope=2.5%, v=1.75 ft/sec, WSE=3.72		XS5, slope=3.25%, v=2.75 ft/sec, WSE=4.33	
H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)
8.25[a]	5.08	0	2.45	15	3.12	-1	0.5	8	1.22
9.25	5.7	1	3.38	17	3.18	-0.75[a]	0.76	9	1.46
10.25	5.82	2	3.85	18	3.14	0	0.96	10	1.88
11.25	6.06	3.67[b]	3.72	19	3.16	1	1.5	10.12[a]	1.92
12.25	6.4	5.5[d]	4.64	20	3.12	2	1.63	10.5	2.12
13.25	6.5	6	4.56	21	3	3	1.68	11	2.38
14.25	6.5	6.5	4.61	22	2.94	4	1.64	11.5	2.68
15.25	6.29	7	4.74	23	2.88	5	2.69	12	2.84
16.25	6.31	7.5	5.25	23.5[a]	3.56	5.1[c]	2.69	12.5	3.1
17.25	6.33	8	5.52	24	3.76	5.5	3.98	12.9[c]	3.58
18.25	6.16	8.5	5.6	25	3.9	6	4.28	13	3.42
19.25	5.94	9	6.09	26	4.2	6.5	4.14	13.5	3.84
20.25	5.94	9.5	6.22	27	4.31	7	4.1	14	4.5
21.25[c]	6.44	10	6.06	28	4.29	7.5	4.3	14.5	4.57
21.75	6.54	10.5	5.93	29	4.39	8	4.4	15	4.64
22.25	6.55	11	5.83	30	4.54	8.45[e]	4.62	16	4.93
22.75	6.5	11.5[e]	6.5	31	4.58	8.5	4.62	17	4.67
23.25	6.58	12	6.21	32	4.79	9	4.49	18	5.04
23.75	6.72	12.5	6.3	32.55[c]	4.59	9.5	4.23	19	4.92
24.25	6.86	13	6.47	33	4.98	10	4.07	20	4.92
24.75	6.98	13.5	6.4	33.5	5.07	10.5	4.56	20.4[e]	5.24
25.25	7.2	14	6.19	34	5.19	11	4.44	21	5.03
25.75	7.34	14.5	5.6	34.5	5.5	11.5	4.5	22	5
26.25	7.58	15	6.05	35	5.46	12	4.38	23	4.8
26.75	7.58	15.5	5.92	35.5	5.53	12.5	4.15	24	4.62
27.25	7.28	16	5.88	36	5.57	13	4	25	4.43
27.75	7.2	16.5	5.14	36.5	5.37	13.5	4.45	26	5.11
28.25	7.56	17	5.14	37	5.49	14	4.06	27	5.4
28.75	7.61	17.5	5.09	37.5	5.55	14.5	3.93	28	5
28.67[e]	7.8	18	5.04	38	5.52	15	3.32	29	4.91
29.25	7.4	18.5	4.91	38.5	5.57	15.5	3.2	30	4.7
29.75	7.4	19	4.8	38.9[e]	5.62	16	3.8	31	4.74
30.25	6.98	19.5	4.87	39	5.59	16.5	3.46	32	4.45
30.75	6.66	20	4.61	39.5	5.52	17	3.51	34	4.45
31.25	6.63	20.5	4.95	40	5.5	17.5	3.83	35	4.6
31.75	6.94	21	5.06	40.5	5.33	18	3.45	36	4.26
32.25	7.06	21.5	5.51	41	4.92	19	2.46	37	4.45
32.75	7.2	22	5.6	42	4.76	20	2.6	38	3.72
33	6.44	22.5	5.69	42.5[d]	4.59	21	2.74	39	4.4
33.25	5.48	23	5.59	43	4.29	22	3.17	40	4.17

Table C-2. East Leon Creek unprocessed cross section data

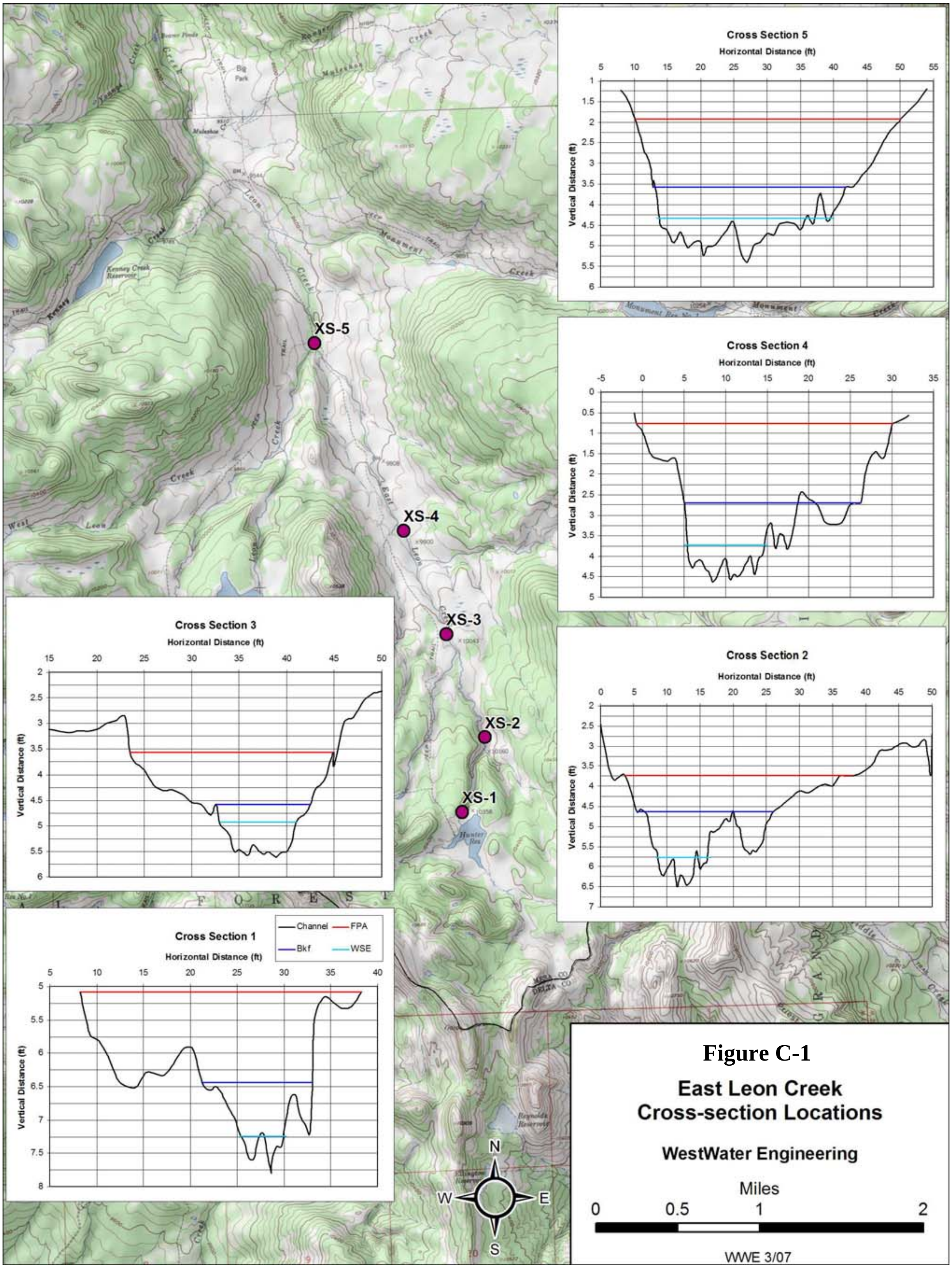
XS1, slope=10%, v=3 ft/sec, WSE=7.24		XS2, slope=5.5%, v=1.92 ft/sec, WSE=5.77		XS3, slope=4%, v=1.28 ft/sec, WSE=4.92		XS4, slope=2.5%, v=1.75 ft/sec, WSE=3.72		XS5, slope=3.25%, v=2.75 ft/sec, WSE=4.33	
H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)	H (ft)	V (ft)
34.25[d]	5.16	23.5	5.62	44	4.1	23	3.22	41	3.93
35.25	5.24	24	5.51	44.9[b]	3.56	24	3.17	41.8[d]	3.58
36.25	5.33	24.5	5.36	45	3.82	25	2.74	42	3.57
37.25	5.29	25	4.94	46	2.98	26	2.71	43	3.56
38.25[b]	5.08	25.5	4.82	47	2.88	*26.25*[d]	*2.69*	44	3.34
		26[c]	4.64	48	2.58	27	1.81	45	3.16
		27	4.52	49	2.42	28	1.45	46	2.93
		28	4.38	50	2.37	29	1.6	47	2.61
		29	4.24			30	0.82	48	2.31
		30	4.11			30.1[b]	0.76	49	2.13
		31	4.16			31	0.69	50	1.97
		32	4.1			32	0.58	50.1[b]	1.92
		33	3.99					52	1.62
		34	3.94					53	1.43
		35	4					54	1.2
		36	3.74						
		37	3.75						
		38	3.74						
		39	3.69						
		40	3.6						
		41	3.44						
		42	3.12						
		43	3.11						
		44	3.08						
		45	2.95						
		46	2.92						
		47	3.02						
		48	2.99						
		49	2.86						
		49.83	3.72[a]						
		50	2.71						

Channel metric
[a] L_{fpa} = left flood prone area
[b] R_{fpa} = right flood prone area
[c] L_{bkf} = left bankfull width and depth
[d] R_{bkf} = right bankfull width and depth
[e] D_{max} = maximum depth at bankfull (thalweg)
WSE = water surface elevation on sample date.

TABLE C-3 WinXS PRO Flow Calculations – Cross Sections 1 through 5, Leon Creek Drainage

Cross Section ID (Location)	Stage Low / High	Measured Stage (ft)	Slope (%)	Mannings Coefficient (n)	Calculated Discharge* (Qc) (cfs)	Measured Discharge (Qm) (cfs)	Measured Velocity V (ft/sec)	Date
XS1 (260316mE 4327407mN)	L	0.6	10	0.070	2.58	2.6	3.00	7/17/2006
	H	1.8	10	0.067	79.39	-	-	-
XS2 (2260589mE 4328124mN)	L	0.7	5.5	0.078	4.55	4.56	1.92	7/18/2006
	H	2.1	5.5	0.074	97.15	-	-	-
XS3 (26027mE 4329156mN)	L	0.7	4.0	0.150	4.84	4.7	1.28	7/27/2006
	H	2.4	4.0	0.098	123.09	-	-	
XS4 (259926m# 4330199mN)	L	0.9	2.5	0.088	8.23	8.2	1.75	7/27/2006
	H	2.4	2.5	0.057	132.55	-	-	-
XS5 (259176mE 4332091mN)	L	0.9	3.25	0.046	18.73	18.8	2.70	7/27/2006
	H	2.5	3.25	0.043	408.34	-	-	-

* Values generated by WinXSpro, A Channel Cross Section Analyzer, Version 3.0 (USDA-FS 2005)


Cross Section 5
Horizontal Distance (ft)
Vertical Distance (ft)
Cross Section 4
Horizontal Distance (ft)
Vertical Distance (ft)
Cross Section 3
Horizontal Distance (ft)
Vertical Distance (ft)
Cross Section 2
Horizontal Distance (ft)
Vertical Distance (ft)
Cross Section 1
Horizontal Distance (ft)
Vertical Distance (ft)
Channel
FPA
Bkf
WSE
XS-5
XS-4
XS-3
XS-2
XS-1
N
S
E
W
Figure C-1
East Leon Creek
Cross-section Locations
WestWater Engineering
Miles
0
0.5
1
2
WWE 3/07

APPENDIX D

JURISDICTIONAL DETERMINATION REQUEST (JD)

JUNE 2007

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
COLORADO/GUNNISON BASIN
REGULATORY OFFICE
400 ROOD AVENUE, ROOM 142
GRAND JUNCTION, COLORADO 81501-2563

REPLY TO
ATTENTION OF

January 27, 2006

Regulatory Branch (200575526)

Mr. Michael W. Klish
Principal Environmental Scientist
WestWater Engineering
2516 Foresight Circle #1
Grand Junction, Colorado 81505

Dear Mr. Klish:

We are responding to your request upon behalf of Ute Water Conservancy District for an approved jurisdictional determination for the Hunter Reservoir Enlargement site. This site is located in the Grand Mesa National Forest, within various Sections, Townships 10 and 11, Range 93 West, Mesa County, Colorado.

Based on available information, and site visits on August 2, and October 6, 2005, we concur with the estimate of waters of the United States, as depicted in your Jurisdictional Determination Request, Ute Water Conservancy District, Hunter Reservoir Enlargement Project, dated November 21, 2005. There are approximately 40 acres of jurisdictional wetlands within the surveyed area that could be impacted by the project. We regulate these wetlands waters under Section 404 of the Clean Water Act since they are adjacent and tributary to other waters of United States.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. A *Notification of Administrative Appeal Options and Process and Request for Appeal* form is enclosed. If you wish to appeal this approved jurisdictional determination, please follow the procedures on the form. You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request.

Please refer to identification number 200575526 in correspondence concerning this project. If you have any questions, please contact me at our Colorado/Gunnison Basin Regulatory Office, 400 Rood Avenue, Room 142, Grand Junction, Colorado 81501-2563, email Ken.Jacobson@usace.army.mil, or telephone (970) 243-1199, extension 11.

Sincerely,

Ken Jacobson
Chief, Colorado/Gunnison Basin
Regulatory Office

Enclosure

Copy furnished without enclosure:

Mr. Ed Tolen, Ute Water Conservancy District, 560 25 Road, Grand Junction, Colorado 81505
Ms. Carrie Surber, Grand Valley Ranger District, GMUG National Forest, 2777 Crossroads Boulevard, Grand Junction, Colorado, 81506

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Ute Water Conservancy District		File Number: 200575526	Date: 1-27-06
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

WestWater Engineering

2516 FORESIGHT CIRCLE, #1 GRAND JUNCTION, COLORADO 81505 (970) 241-7076 FAX: (970) 7097

November 21, 2005

Mr. Ken Jacobson
402 Rood Avenue, Room 142
Grand Junction, CO 81501

RE: Jurisdictional Determination Request
Ute Water Conservancy District
Hunter Reservoir Enlargement Project
GMUG National Forest, Mesa County, Colorado

Dear Mr. Jacobson:

This is to request a COE Jurisdiction Determination and confirmation of the wetland delineation performed by WestWater at Hunter Reservoir located on the GMUG National Forest in Mesa County, Colorado.

Please provide copies of your reply to:

Mr. Ed Tolen
Ute Water Conservancy District
560 25 Road
Grand Junction, CO 81505

Ms. Carrie Surber
Grand Valley Ranger District
GMUG National Forest
2777 Crossroads Blvd
Grand Junction, CO 81506

Please feel free to contact our office if you have questions regarding this request.

Sincerely,

Michael W. Klish

Michael W. Klish
Principal Environmental Scientist

attachments

cc: Ed Tolen, UWCD
Carrie Surber, GMUG NF

COE Jurisdictional Determination Request
Proposed Ute Water Conservancy District Expansion of Hunter Reservoir
Mesa County, Colorado (COE # 200575526)

November 2005

This is a request for COE jurisdictional determination and confirmation of a wetland delineation performed on the site of the proposed Hunter Reservoir Enlargement Project, in the Grand Mesa National Forest, northeast Mesa County, Colorado (see Map 1). The delineation was performed by WestWater Engineering (WestWater) Biologists on the following dates: Oct. 4-8, 11-15, 2004, and Aug. 19, Sep. 13, 14, 16, 20, 2005, in accordance with COE standards included in the "Corps of Engineers Wetlands Delineation Manual, Environmental Laboratory, Vicksburg, MS, January 1987". Onsite reviews of the delineation with COE were held on September August 2 and October 6, 2005. Project information follows:

PROJECT INFORMATION		
Project Proponent:	Ute Water Conservancy District 560 25 Road Grand Junction, CO 81505	 Ph: (970) 242-7491 Fax: (970) 242-9189
Land Owner:	United States Forest Service Grand Valley Ranger District 2777 Crossroads Blvd., Suite A Grand Junction, CO 81506	 Ph: (970) 242-8211
Wetland Consultant:	WestWater Engineering 2516 Foresight Circle #1 Grand Junction, CO 81505	 Ph: (970) 241-7076 Fax: (970) 241-7097
Project Location:	Reservoir: Sections 27, 34, T11S, R93W, 6th PM Project Centroid Location: UTM 13S 260401mE, 4327164mN WGS84; 39.06071° N Latitude, 107.76914° W Longitude Road Crossings: Sec. 4, 9, 15, 22, 27 T11S, R93W & Sec. 7 T10S, R93W	
Project Description:	Hunter Reservoir Rehabilitation Project (see "Project Initiation Letter for Hunter Reservoir Enlargement, July 27, 2005", COE # 200575526, provided by USFS under separate cover).	

Ute Water Conservancy District (UWCD) currently holds the water rights stored in Hunter Reservoir (a.k.a. Kirkendall Dam). The existing reservoir has a capacity of 110 acre-feet with an inundated area of approximately 16 surface acres. The proposed project would increase the capacity of the reservoir to 1350 AF and inundate an area of approximately 80 surface acres. UWCD holds rights to store 110 AF with an appropriation date of July 28, 1902 and has conditional rights to store an additional 582.5 AF of water at this site with an appropriation date of July 24, 1952. Additionally, UWCD has 5,650 AF of conditional rights, with a priority date of September 17, 1970, for a proposed reservoir at the Big Park site lower in the Leon Creek Basin. This reservoir expansion represents the UWCD's plan to use their 1952 conditional water rights on the Leon Creek watershed and to store a portion of their conditional rights from the Big Park site within Hunter Reservoir.

Delineation Methods – The delineation included the areas within and in close proximity to the new high water level of the expanded reservoir as well as wetlands crossed by the Forest Service road that provides access to the site. The wetland boundaries were identified on the basis of the vegetation, soils and hydrology present at the site in accordance with COE manual. The wetland boundary delineations included identification of plant species, vegetation composition and structure; shallow soil borings (18 ± inches deep) for observation of hydrologic and soils characteristics; and observations of drainage patterns and other hydrologic indicators. The wetland boundaries based on this evaluation were marked with numbered colored flags, with unique numbering schemes for each of the specific wetland areas.

Delineation Findings – WestWater identified forty-nine wetland areas, representing three unique wetland types, present on and around the subject site (Tables 1& 2, Maps 1 & 2). Wet meadows around the reservoir site represent the largest wetland type in the project area (44.58 acres). The dominant species are *Carex saxattilis, C. aquatilis* and *Deschampsia caespitosa.* The largest wet meadow (A) encircles the existing reservoir. There were three additional intermediate sized wet meadow areas (B, E & J) and seventeen small, wet meadow depressions (PH001 – PH017). Three areas that did not exhibit wetland characteristics within wet meadow A were identified and mapped (i.e., "dry islands" K, Q, R). The next largest wetland type is the littoral zone (C; 6.26 acres), consisting of emergent wet meadow found along the reservoir margins, generally restricted to water depths of approximately 2 feet and shallower. Littoral zone dominant species are *Carex aquatilis, Potemogeton spp*. A third wetland type, fen (F; 1.92 acres), was found south of the existing reservoir and was identified based on the presence of histosols exceeding 16 inches in depth. Dominant species of the fen are 3 speices of moss, *Pedicularis groelandica , Carex saxattilis and C. aquatilis*. Additionally, the Forest Service road to the reservoir crosses twenty-six wetlands and Waters of the US (RCA – RCZ; 0.79 acres) that will be impacted by improvements necessary to allow construction equipment and vehicles access to Hunter Reservoir.

Upland to wetland transects were installed for each wetland area and relevant vegetation, soils and hydrologic characteristics were recorded on COE Data Forms (attached). A brief summary of findings for each wetland area follows.

Table 1. Wetland Area Summary

Wetland Type (& Area)	Area ID	Flag Numbers*	Upland/Wetland Transects
Wet Meadow (Total area = 4.58 acres)	A	A001-A023, B011-B002, A032-A051, L019-L003, A068-A086 ** A087-A091, O062-O077, O001-O041, A103-A111, N025-N002, A116-A119, M001-M011, A129-A137, P001-P030, A155-A157 ** A158-A183 ** A184-A193 ** A194-A267 ** A268-A297 ** A298-A344, S001-S021, A369-A433	TA1U (upland) – TA1W (wetland), Located between boundary flags A006 & A007. TA2U – TA2W, between flags A394 & A395. TH1U – TH1W, between flags O068 & O069. TOU – TOW, between flags O011 & O012. TPU – TPW, between flags P009 & P010.
Dry islands in Wet Meadow A	K	K001-K018	TKU – TKW, between flags K001 & K018.
	Q	Q001-Q015	TGU – TGW, between flags Q001 & Q015.
	R	R001-R006	
Additional Wet Meadows	B	A093-A101, O044-O061	
	J	J001-J006, A030	
	E	E001 center flag (15 ft diameter)	
Small Wet Meadow depressions surrounded by upland.	PH1 to PH17	PH001 (50 ft^2) PH002 (113 ft^2) PH003 (78 ft^2) PH004 (7 ft^2) PH005 (50 ft^2) PH006 (20 ft^2) PH007 (113 ft^2) PH008 (20 ft^2) PH009 (50 ft^2) PH010 (7 ft^2) PH011 (50 ft^2) PH012 (78 ft^2) PH013 (7 ft^2) PH014 (50 ft^2) PH015 (20 ft^2)	

Wetland Type (& Area)	Area ID	Flag Numbers*	Upland/Wetland Transects
		PH016 (20 ft^2) PH017 (7 ft^2)	
Littoral Zone – emergent wetland (6.26 acres)	C D	C001-C145 Upper D001-D136 Lower	
Fen – histosols >16in in depth (1.92 acres)	F	F001- F023	
Reservoir Bottom – waters of the US below ordinary high water (14.04 acres)	D	D001-D136	
Wetland Road Crossings (0.79 acres)	RCA	RCA1-RCA6	
	RCB	RCB1-RCB6	
	RCC	RCC1-RCC6	
	RCD	RCD1-RCD6	
	RCE	RCE1-RCE6	
	RCF	RCF1-RCF6	
	RCG	RCG1-RCG6	
	RCH	RCH1-RCH6	
	RCI	RCI1-RCI6	
	RCJ	RCJ1-RCJ6	
	RCK	RCK1-RCK6	
	RCL	RCL1-RCL6	
	RCM	RCM1-RCM6	
	RCN	RCN1-RCN6	
	RCO	RCO1-RCO6	
	RCP	RCP1-RCP6	
	RCQ	RCQ1-RCQ6	
	RCR	RCR1-RCR6	
	RCS	RCS1-RCS6	
	RCT	RCT1-RCT6	
	RCU	RCU1-RCU6	
	RCV	RCV1-RCV6	
	RCW	RCW1-RCW6	
	RCX	RCX1-RCX6	
	RCY	RCY1-RCY6	
	RCZ	RCZ1-RCZ6	

* Some flag numbers are missing from the mapped polygons, specifically, missing from Wetland A4 are numbers A180, A257, A311 & N008. Missing from Wetland F is number F020.

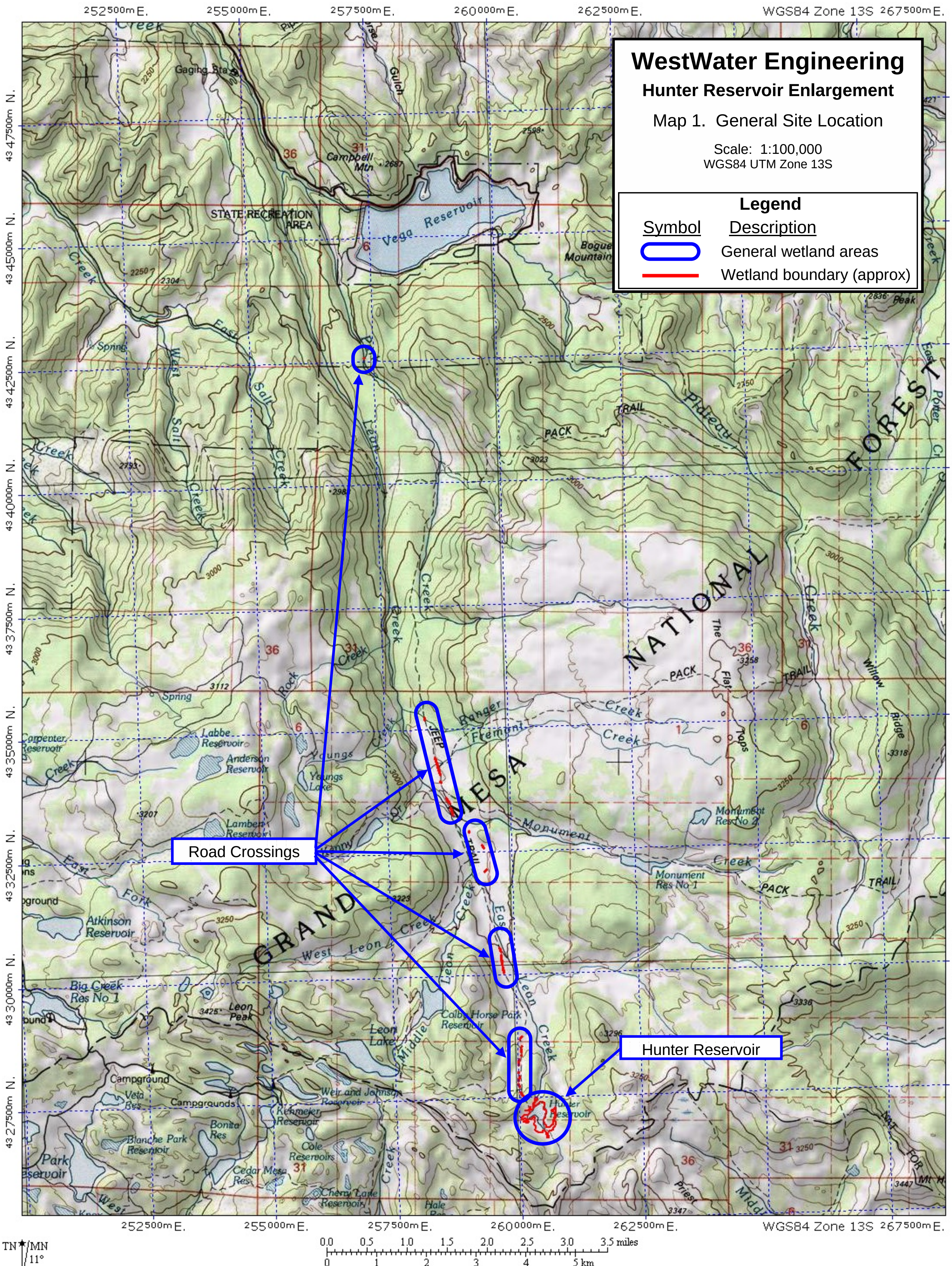
** In Wetland A, flag numbers interrupted by a double asterisk indicate locations where this delineation was ended; however wetland conditions continue for an indeterminate distance (see Map 2).

Table 2. Wetland Area Impacted by Proposed Project

Wetland Type	Wetland IDs	Area Impacted
Wet Meadow	A, B, E, J, PH001 – PH017	29.99 acres
Littoral Zone	C	6.26
Fen	F	1.92
Wetland Road Crossings	RCA – RCZ	0.79

All flagged points were located and mapped by Ute Water Conservancy District.

Road crossings are depicted on Map1(attached) as are coordinate points of the crossings. Wetland boundaries and a list of coordinate points for all wetland boundary flags are included on Map 2 (attached).



Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Hunter Reservoir		Date	Oct 15, 2004
Applicant / Owner Ute Water Conservancy District		County	Mesa
Investigator Klish/Renner/Alward		State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TA1U
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Deschampsia caespitosa	G	FACW	9		
2 Fragaria virginiana	F	FACU	10		
3 Poa pratensis	G	FAC	11		
4 Caltha leptosepala	F	OBL	12		
5 Sibbaldia procumbens	F	NI	13		
6 Bistorta bistortoides	F	—	14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 60

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	None (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 5/3			Silty loam
6-12		10 YR 6/3			
12-18		10 YR 6/4			

HYDRIC SOIL INDICATORS:

- ☐ Histosol None
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir		Date	Oct 15, 2004
Applicant / Owner	Ute Water Conservancy District		County	Mesa
Investigator Klish/Renner/Alward			State	CO
Do Normal Circumstances exist on the site?		[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?		YES [NO]	Transect ID	TA1W
Is the area a potential Problem Area? (If needed, explain on reverse)		YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Carex utriculata	G	OBL	9		
2 Deschampsia caespitosa	G	FACW	10		
3 Caltha leptosepala	F	OBL	11		
4 Sibbaldia procumbens	F	NI	12		
5 Calamagrostis canadensis	G	OBL	13		
6 Bistorta bistortoides	F	—	14		
7			15		
8			16		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 80					
Remarks					

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☑ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 3/2			Silty loam
6-12		10 YR 4/2			
12-18		10 YR 4/3			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	[YES] NO	
Hydric Soils Present?	[YES] NO	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Oct 15, 2004
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TA2U
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Deschampsia caespitosa	G	FACW	9		
2 Fragaria virginiana	F	FACU	10		
3 Poa pratensis	G	FAC	11		
4			12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 60

Remarks

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None	(in)
Depth to Free Water in Pit	None	(in)
Depth to Saturated Soil	None	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None

- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 5/3			Silty loam
6-12		10 YR 6/3			
12-18		10 YR 6/3			

HYDRIC SOIL INDICATORS:

None

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**[YES]** NO	Is this Sampling Point Within a Wetland? YES **[NO]**
Wetland Hydrology Present?	YES **[NO]**	
Hydric Soils Present?	YES **[NO]**	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Oct 15, 2004
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TA2W
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Carex utriculata	G	OBL	9		
2 Calamagrostis canadensis	G	OBL	10		
3 Scirpus spp	G	OBL	11		
4			12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100

Remarks

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☑ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 3/2			Silty loam
6-12		10 YR 3/1			
12-18		10 YR 4/2			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	[YES] NO	
Hydric Soils Present?	[YES] NO	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION

(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Oct 13, 2004
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TGU
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Gentiana spp	F	FAC	9		
2 Vaccinium spp	S	FACU	10		
3 Poa pratensis	G	FAC	11		
4 Fragaria virginiana	F	FACU	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 50

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS	
Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	None (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		7.5 YR 5/2			Silty loam
6-12		7.5 YR 6/3			
12-18		7.5 YR 6/4			

HYDRIC SOIL INDICATORS:

- ☐ Histosol None
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir		Date	Oct 13, 2004
Applicant / Owner	Ute Water Conservancy District		County	Mesa
Investigator	Klish/Renner/Alward		State	CO
Do Normal Circumstances exist on the site?	[YES]	NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES	[NO]	Transect ID	TGW
Is the area a potential Problem Area? (If needed, explain on reverse)	[YES]	NO	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Carex utriculata	G	OBL	9		
2 Salix planifolia	S	OBL	10		
3 Scirpus spp	G	OBL	11		
4 Deschampsia caespitosa	G	FACW	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100

Remarks

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	12 (in)
Depth to Saturated Soil	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☑ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		7.5 YR 3/1			
6-12		7.5 YR 4/1			
12-18		7.5 YR 5/3			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☑ Histic Epipedon
- ☑ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	[YES] NO	
Hydric Soils Present?	[YES] NO	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Oct 15, 2004
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TH1U
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Fragaria virginiana	F	FACU	9		
2 Poa pratensis	G	FAC	10		
3 Achilla lanulosa	F	FACW	11		
4			12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 66

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None	(in)
Depth to Free Water in Pit	None	(in)
Depth to Saturated Soil	None	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 5/3			Silty loam
6-12		10 YR 5/4			
12-18		10 YR 6/4			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors

None

- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION

(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Oct 15, 2004
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TH1W
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Carex utriculata	G	OBL	9		
2 Deschampsia caespitosa	G	FACW	10		
3 Salix planifolia	S	OBL	11		
4			12		
5			13		
6			14		
7			15		
8			16		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100					
Remarks					

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		7.5 YR 3/1			Silty loam
6-12		7.5 YR 3/2			
12-18		7.5 YR 4/3			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☑ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	[YES] NO	
Hydric Soils Present?	[YES] NO	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site Hunter Reservoir		Date Sept 20, 2005
Applicant / Owner Ute Water Conservancy District		County Mesa
Investigator Klish/Renner/Alward		State CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID TKU
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Sibbaldia procumbens	F	—	9		
2 Poa pratensis	G	FACU	10		
3 Deschampsia caespitosa	G	FACW	11		
4 Caltha leptosepala	F	OBL	12		
5 Carex aquatilus	G	OBL	13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 60

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS	
Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	None (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 4/3		No Mottle	Loam
6-12		10 YR 6/3		No Mottle	Clay
12-18		10 YR 6/4			

HYDRIC SOIL INDICATORS:

☐ Histosol None
☐ Histic Epipedon
☐ Sulfidic Odor
☐ Aquic Moisture Regime
☐ Reducing Conditions
☐ Gleyed or Low-Chroma Colors
☐ Concretions
☐ High Organic Content in Surface Layer in Sandy Soils
☐ Organic Streaking in Sandy Soils
☐ Listed on Local Hydric Soils List
☐ Listed on National Hydric Soils List
☐ Other (Explain in Remarks)

Remarks:

No hydric indicators

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir			Date	Sept 20, 2005
Applicant / Owner	Ute Water Conservancy District			County	Mesa
Investigator	Klish/Renner/Alward			State	CO
Do Normal Circumstances exist on the site?		[YES]	NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?		YES	[NO]	Transect ID	TKW
Is the area a potential Problem Area? (If needed, explain on reverse)		YES	[NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Carex aquatilus	G	OBL	9		
2 Deschampsia caespitosa	G	FACW	10		
3 Caltha leptosepala	F	OBL	11		
4 Bistorta bistortoides	F	—	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 75

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	No Water at Time of Survey* (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):		Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO	

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 4/3		No Mottle	Loam
6-12		10 YR 4/2		No Mottle	Clay
12-18		10 YR 5/3			

HYDRIC SOIL INDICATORS:

- ☐ Histosol None
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	YES [NO*]	
Hydric Soils Present?	[YES] NO	

Remarks

* Wetland hydrology was present and noted on Aug. 19, 2005, however it was no longer present at the time of this survey.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir			Date	Sept 20, 2005
Applicant / Owner	Ute Water Conservancy District			County	Mesa
Investigator	Klish/Renner/Alward			State	CO
Do Normal Circumstances exist on the site?		[YES]	NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?		YES	[NO]	Transect ID	TOU
Is the area a potential Problem Area? (If needed, explain on reverse)		YES	[NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Caltha leptosepala	F	OBL	9		
2 Deschampsia caespitosa	G	FACW	10		
3 Carex aquatilus	G	OBL	11		
4			12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	None (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 4/3			Loam
6-12		10 YR 4/4			Clay
12-18		10 YR 5/4			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors

None

- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

No definitive soil indicators

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Sept 20, 2005
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TOW
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Caltha leptosepala	F	OBL	9		
2 Deschampsia caespitosa	G	FACW	10		
3 Carex aquatilus	G	OBL	11		
4 Bistorta bistortoides	F	—	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 66

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	No Water at Time of Survey* (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None
- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 4/3		No Mottle	Loam
6-12		10 YR 3/2		No Mottle	Clay
12-18		10 YR 6/3			

HYDRIC SOIL INDICATORS:

- ☐ Histosol None
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	YES [NO*]	
Hydric Soils Present?	[YES] NO	

Remarks

* Wetland hydrology was present and noted on Aug. 19, 2005, however it was no longer present at the time of this survey

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir	Date	Sept 20, 2005
Applicant / Owner	Ute Water Conservancy District	County	Mesa
Investigator	Klish/Renner/Alward	State	CO
Do Normal Circumstances exist on the site?	[YES] NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES [NO]	Transect ID	TPU
Is the area a potential Problem Area? (If needed, explain on reverse)	YES [NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Sibbaldia procumbens	F	NI	9		
2 Juncus drummondii	G	FACW	10		
3 Potentilla spp.	F	—	11		
4 Caltha leptosepala	F	OBL	12		
5 Deschampsia caespitosa	G	FACW	13		
6 Carex aquatilus	G	OBL	14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 75

Remarks

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	None	(in)
Depth to Free Water in Pit	None	(in)
Depth to Saturated Soil	None	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None

- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):			Drainage Class:		
Taxonomy (Subgroup)			Field Observations Confirm Mapped Type? YES NO		
PROFILE DESCRIPTION					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 3/3			Loam
6-12		10 YR 6/3			Clay
12-18		10 YR 6/4			

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors

None

- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? YES [NO]
Wetland Hydrology Present?	YES [NO]	
Hydric Soils Present?	YES [NO]	

Remarks

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	Hunter Reservoir		Date	Sept 20, 2005
Applicant / Owner	Ute Water Conservancy District		County	Mesa
Investigator	Klish/Renner/Alward		State	CO
Do Normal Circumstances exist on the site?	[YES]	NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES	[NO]	Transect ID	TPW
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	[NO]	Plot ID	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Caltha leptosepala	F	OBL	9		
2 Juncus drummondii	G	FACW	10		
3 Carex aquatilus	G	OBL	11		
4 Deschampsia caespitosa	G	FACW	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 100

Remarks

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks)
  - ☐ Stream, Lake, or Tide Gauge
  - ☐ Aerial Photographs
  - ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	No Water at Time of Survey* (in)
Depth to Free Water in Pit	None (in)
Depth to Saturated Soil	4 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators: None

- ☐ Inundated
- ☑ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):

- ☑ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup)	Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 3/3		No Mottle	Loam
6-12		10 YR 4/2		No Mottle	Clay
12-18		10 YR 4/2			

HYDRIC SOIL INDICATORS:

- ☐ Histosol None
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	[YES] NO	Is this Sampling Point Within a Wetland? [YES] NO
Wetland Hydrology Present?	YES [NO*]	
Hydric Soils Present?	[YES] NO	

Remarks

* Wetland hydrology was present and noted on Aug. 19, 2005, however it was no longer present at the time of this survey.

Department of Agriculture
Forest Service
Grand Mesa, Uncompahgre and Gunnison National Forests

HUNTER RESERVOIR ENLARGEMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Appendix E
Management Indicator Species Assessment

HUNTER RESERVOIR ENLARGEMENT

Management Indicator Species Assessment
June 2007

I. INTRODUCTION

This assessment is prepared in accordance with changes in the Management Indicator Species (MIS) list that were made with the MIS Amendment (FS 2005) to the 1991 Amended Land and Resource Management Plan (LRMP or Forest Plan) of the Grand Mesa, Uncompahgre, and Gunnison National Forests (GMUG) (FS 1991). This report addresses only the enlargement of Hunter Reservoir, located on upper East Leon Creek, and temporary improvements to the access road.

Primary sources of information for this assessment were from the district wildlife sightings records and information from species assessments prepared for Senstitive Species and Management Indicator Species in FS Region 2. Literature reviews have recently been conducted to incorporate recent scientific literature that may be pertinent to the evaluation of impacts or beneficial effects to the MIS and Sensitive Species. The Comprehensive Assessment done by the GMUG (July, 2006) was reviewed for ecosystem level scales perspective. The forest scale analysis was addressed for MIS in the updated GMUG MIS Assessment (FS 2005), which is referred to in this analysis, as a comparison with the project level impacts. These assessments used current scientific literature as well as the most recent population and trend information, and are the most pertinent information specific to the GMUG National Forest.

Three vegetative types will be impacted by the enlargement of Hunter Reservoir. These types and their areas are presented in Table E-1 below. Approximately 88.8 acres of vegetation would be affected by the Proposed Action, including 32 acres of wetland. Existing and new access roads (4.5 acres) would be reclaimed upon completion of the project, however; 84.3 acres of habitat would be permanently affected.

Table E-1. Vegetation Types and Acreages Affected by Proposed Action

Vegetation Type	Hunter Reservoir (acres)	Existing Access Road	New Access Road
Spruce/fir	17.5	0.3	2.7
Willow/riparian	11.8	1.2	<0.1
Grass/forb/shrub	55.0	0.1	<0.1

The existing access road runs through wetlands along a tributary of East Leon Creek. The new access road will re-locate approximately ½ mile of this road out of the wetlands to an upland location. That ½ mile of old access road will be reclaimed and access to Hunter Reservoir post-construction will be via the new access road, which will be allowed to return to a primitive state when no longer needed for construction activities.

Selection of Management Indicator Species (MIS) For Analysis

MIS are those species that have been selected by national forests within their Forest Plans to represent the habitat needs of a larger group of species requiring similar habitats. Descriptions of the habitat relationships, distributions and trends, population trends and status, and summaries of their associated Forest Plan Directions, Standards and Guidelines for the forest MIS, are described in the Management Indicator Species Assessment for the Grand Mesa, Uncompahgre and Gunnison National Forests (June 2001) (FS 2001) as well as the updated GMUG 2005 MIS Assessment. The MIS listed in the 2005 MIS Forest Plan Amendment, are summarized in Table E-3, along with the determination of either their known presence or the presence of suitable habitat within the project area. Suitable habitat is based on field surveys, a review of the literature, and forest mapping of the vegetation.

The four trout species are combined for the purposes of this report and referred to as common trout, although not all species are present near Hunter Reservoir or the access road.

Species Excluded From Further Analysis

All species in Table E-2 that were not known to be present within the project area, or did not have associated habitat types within the project area, were excluded from further asssessment.

Table E-2. MIS, their habitat associations, and the potential for their occurrence in the Hunter Reservoir project area

Common Name	Scientific Name	Habitat Associations	Habitat or species Present Within the Project Analysis Area?
Rocky Mountain elk	*Cervus elaphus*	Early succession spruce-fir, Douglas-fir, lodgepole, aspen, mountain shrub. Also MIS for travel mgmt.	Yes
Abert's squirrel	*Sciurus aberti*	Mature to late seral ponderosa pine	No*
American marten	*Martes americana*	Late-succession spruce-fir, lodgepole pine	Yes
Merriam's Wild Turkey	*Meleagris gallopavo*	Oak and Pinyon-Juniper Aspen, mixed conifer	No*
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Aspen/Cavity Nester	Yes
Northern Goshawk	*Accipiter gentilis*	Late-succession aspen, aspen/conifer mix	Yes
Brewer's Sparrow	*Spizella breweri*	Mature sagebrush	No*
Colorado River cutthroat trout (CRCT)	*Oncorhynchus clarki pleuriticus*	Aquatic and riparian habitats	Yes
Rainbow trout	*Oncorhynchus mykiss*	Aquatic and riparian habitats	Yes
Brown trout	*Oncorhynchus trutta*	Aquatic and riparian habitats	No
Brook trout	*Salvelinus fontinalis*	Aquatic and riparian habitats	Yes

* The habitat associated with this species is not known to occur in the project area, and the species is either not known to occur there or its occurrence in the project area is incidental and not representative for its associated habitat. They will not be directly, indirectly, or cumulatively impacted by proposed activities and no further analysis is necessary.

Species and Habitat Types Selected For Further Analysis

Subalpine grass/forb and spruce/fir are by far the largest habitat types which will be altered by the proposed project. However, all MIS species with documented presence or known habitat within the Leon Creek drainage that could potentially be affected by changes to or activities within the project area will be addressed, and they are:

Generalist species:

- Rocky Mountain elk

Spruce/fir associated species

- American marten

Aspen and aspen/conifer mix associated species:

- Red-naped sapsucker
- Northern goshawk

Aquatic species:

- Common trout (cutthroat, rainbow, brook and brown)

Table E-1 indicates there is no aspen or aspen/conifer mix vegetation affected by the project. However, such vegetation is found in the Leon Creek drainage within 2 miles of Hunter Reservoir, so the species associated with those vegetative types, red-naped sapsucker and northern goshawk, are analyzed. Furthermore, there are records of these two species breeding in stands of spruce/fir, and Hunter Reservoir is within the known elevational breeding range of these two species (Andrews and Righter 1992).

Much of the following information on life history and biology for the various MIS was assembled by Forest Service (FS) personnel (FS 2005*b*).

II. ANALYSIS OF EFFECTS

Effects Assessment for Selected MIS

<u>Rocky Mountain Elk</u>

Life History/ Biology

The Forest Plan includes standards and guidelines for management of habitat for the Rocky Mountain elk. These are summarized in Table E-3.

Population Trends

The Colorado Division of Wildlife (CDOW) has specific elk management goals and objectives that have been developed in cooperation with landowners, the public, and federal land management agencies. These plans help guide the CDOW's direction in the management of elk on the various Data Analysis Units (DAU), and provide data for recommending specific hunting regulations to meet State herd objectives.

Table E-3. Forest objectives for Rocky Mountain elk.

<table>
<tr><th>Management Activities</th><th>General Direction</th><th>Standards and Guidelines</th></tr>
<tr><td>Aquatic and Terrestrial Habitat Management</td><td>Manage for habitat needs of indicator species</td><td>a. Deer and Elk. Provide hiding cover within 1000’ of any known calving areas.</td></tr>
<tr><td></td><td></td><td>k. Deer, elk black bear, goshawk: In areas of historic shortage of dry season water, where there is less than one source per section, create one source per section.</td></tr>
<tr><td></td><td>Maintain habitat for viable population of all existing vertebrate wildlife species</td><td>a. Maintain habitat capability at a level at least 40% of potential capability. (This standard varies within each Management Area).</td></tr>
<tr><td>Habitat Improvement and Maintenance</td><td>Use both commercial and non-commercial silvicultural practice to accomplish wildlife habitat objectives</td><td>a. In forested areas, maintain deer or elk cover on 60% or more of the perimeter of all natural and created openings, and along at least 60% of each arterial and collector road that has high levels of human use during the time deer and elk would be expected to inhabit the area. Cover should be located and measured perpendicular to the road. Gaps between cover along roads should not exceed ¼ mile. Roads with restricted use could provide for less cover. Maintain cover along 40% of each stream and river.</td></tr>
<tr><td></td><td></td><td>b. In diversity units, dominated by forested ecosystems, the objective is to provide for a minimum habitat effectiveness of 40% over time. Habitat effectiveness will be determined by evaluating hiding and thermal cover, forage, roads, and human activity on the roads. Cover should be well distributed over the unit. Hiding and thermal cover may be the same in many cases. Minimum size cover areas for mule deer are 2-5 acres and for elk 30-60 acres.</td></tr>
<tr><td></td><td></td><td>c. In diversity units dominated by non-forested ecosystems, maintain deer and elk hiding cover as follows:
<table>
<tr><td>% of Unit Forested</td><td>% of Forested Area in Cover</td></tr>
<tr><td>35-50</td><td>≥50%</td></tr>
<tr><td>20-34</td><td>≥60%</td></tr>
<tr><td><20</td><td>≥75%</td></tr>
</table>
These levels may be exceeded</td></tr>
</table>

Table E-3. Forest objectives for Rocky Mountain elk.

Management Activities	General Direction	Standards and Guidelines
		temporarily during periods when stands are being regenerated to mee the cover standard, or to correct tree disease problems, in aspen stands, or where windthrown or wildfire occurred. Maintain hiding cover along at least 75% of the edge of arterial and collectgor roads, and at least 60% along streams and rivers, where trees occur.
		d. Alter age classes of browse stands in a diversity unit, no more than 25% within a ten-year period.
	Improve habitat capability through direct treatments of vegetation, soil, and water.	
	Maintain edge contrast of at least medium or high between tree stands created by even-aged management.	

Elk are also an MIS for travel management in the Forest Plan. Elk habitat effectiveness is influenced by the density of open roads and motorized trails and by the amount of human activity on those roads and trails. Related Forest Travel Plan standards and guidelines are as follows:

Management Activities	General Direction	Standards and Guidlines
Transportation System Management	04 Manage public motorized use on roads and trails to maintain or enhance effective habitat for elk	a. Objective level of habitat effectiveness for elk within each fourth order watershed is at least 40%. (This standard varies within each Management Area).
		b. Habitat effectiveness will be determined by evaluating, in combination, hiding and thermal cover, forage, road density and human activity on roads. The HABCAP model accomplishes this analysis.
	05 Manage road use by seasonal closure if: c. Use causes unacceptable wildlife conflict or habitat degradation	
	06 Keep existing roads open to public motorized use unless: g. Use conflicts with wildlife management objectives.	

Periodically (every 10 years), these plans are updated to cover land management changes, new social perspectives, and changes in wildlife populations.

DAUs are composed of Game Management Units (GMU). The GMUs are used to implement harvest objectives defined in a specific DAU. Land status and management can be composed of private, federal, corporation, and state lands, with percentages of each varying by area. In some cases, land status may overlap DAU and GMU boundaries. Hunter Reservoir is within DAU E-14.

At the current time, two of the major influences on elk management are human population growth and anthropogenic perturbation of elk range. Both of these can and do influence management of big game populations. Most environmental perturbation from land development can be seen on winter range and transitional range, with some influence associated with summer range, particularly the borders of federal lands or development occurring on federal lands. Along with population growth and subsequent loss of habitat comes an increase in demands for hunting recreational activities, which in turn can further complicate managing big game populations.

Elk are generalists in that they feed by both grazing and browsing and are able to digest large quantities of what would be considered low quality feed for domestic livestock. Grasses, shrubs (including sage brush), aspen twigs, and bark are important winter forage components. In some areas of Colorado dead leaves comprise a portion of the winter diet. Generally, forbs are more important in the late spring and early summer. Grasses increase in importance as the summer progresses (Fitzgerald et al. 1994). In some areas of Colorado 77-90% of the summer diet is composed of grasses, and browse constitutes 56% of the winter diet (Boyd 1970).

Under normal circumstances elk are nocturnal or crepuscular with regard to their activities. Elk tend to rest during the daytime and usually bed in heavy and old growth timber. In the winter elk do seek cover but may bed out on open slopes in the snow.

Many, but not all elk populations, are migratory using different ranges for winter, spring (transitional), summer and fall (transitional). Summer ranges tend to be higher in elevation while winter ranges occur at lower elevations.

Elk start breeding in the late summer and usually complete breeding activity by the end of October. Mature bulls acquire harems consisting of cows with their calf of the year. Females breed yearly having up to 3 estrous cycles if initial breeding was unsuccessful. The success rate for mature females in Colorado is 76% (Freddy 1987). The majority of breeding is done by bulls 3 years and older. Conception rate for yearling bulls breeding is low. Adult cows typically produce 1 calf per year with twins being rare. Female bands will migrate together to calving grounds from their winter/spring ranges. The female will isolate herself from the herd to bear her calf. Calving sites are usually found where water, cover and forage are close to one another. The cow and calf will return to the herd in 2-3 weeks.

Habitat Requirements

Elk in Colorado are generally found above 6,000 feet (1,800 m). They utilize a variety of habitats which include lodgepole (*Pinus contorta*), spruce/fir (*Picea engelmannii & Abies lasiocarpa*), Douglas-fir (*Psuedotsuga menziesii)*, quaking aspen (*Populus tremuloides*) and mountain shrub types in combination with high mountain alpine meadows and lower meadows and pastures depending on the season. Elk require a combination of open meadows for foraging and woodlands for hiding cover, calving and thermal regulation. The use of open areas by elk tends to decrease 100 m from the forest edge. Slopes from 15-30% are preferred (FS 2002). Ideal winter range would include north to northeast facing slopes of densely wooded lowlands for cover combined with south to southwest facing slopes for foraging opportunities. Good transitional range usually includes aspen, meadows, pastures, and other woodland types that provide high quality forage enabling the elk to gain weight prior to winter. Open water availability is also important in association with the habitat types described. Elk can extract some water from consumed plants in the summer and eat snow in the winter (NRCS 1999).

The elk herds in the Leon Creek drainage of the Grand Mesa are migratory using high elevation forests of spruce/fir, Douglas-fir, and aspen stands combined with subalpine meadows during the summer. Transitional ranges include lower elevation aspen stands in addition to the woodland types previously mentioned. Winter range includes slopes that interface with meadows, pastures, and sagebrush. Certain portions of the elk winter range have other shrubland habitat components such as Gambel's oak (*Quercus gambelii*) and mountain mahogany (*Cercocarpus montanus*). Willow covered stream corridors are also important. They are used for cover and forage on the Grand Mesa. Aspen is a habitat component potentially used by the elk year round for forage, cover and calving. In severe winters shrublands can become critical for elk survival along with aspen stands. Parks and meadows are a critical component within the life needs of elk. These areas provide the bulk of the grasses and forbs that the elk depend on during spring, summer and fall.

Available Habitat on the GMUG

Forestwide summer habitat for Rocky Mountain elk includes all the above habitat types for a total of 3,103,088 acres of potentially suitable elk habitat (Table E-4). Suitable summer habitat for elk within the Leon Creek drainage includes aspen, subalpine grass/forb, and spruce/fir. There is no winter habitat near Hunter Reservoir.

Population Information

The Leon Creek drainage lies within CDOW GMU 421, which is part of DAU E-14 for elk. The CDOW uses several methods to determine population objectives for the DAUs. Monitoring of populations may be done by one or more of the following methods: postseason aerial counts, radio telemetry, computer model simulations, density estimates, quadrat surveys, line transects, research projects, and phone or written hunter surveys. Figure E-1 tracks elk populations over the years within DAU E-14. Table E-5 displays the population objectives and game management units within DAU E-14 on the GMUG.

The CDOW population objective for elk in this DAU is 10,500. The post-hunt population estimates for DAU E-14 have been 11,670, 10,020 and 11,460 for the years 2001, 2002, and 2003, respectively. These figures suggest that Leon Creek drainage is within an area containing a fairly stable elk population.

Table E-4. Potentially suitable summer habitat* for Rocky Mountain elk on the GMUG by vegetative cover type and habitat structural stage.

Cover Type	*1*	*2*	*3A*	*3B*	*3C*	*4A*	*4B*	*4C/5*	*Totals*
Aspen		4,743	55,301	211,399	41,446	23,567	227,148	176,278	739,881
Cottonwood Riparian			248	100		2,530	1,532	42	4,452
		291,383	472	82		416			292,353
Gambel Oak									
	462,355								462,355
Mountain Grassland		165,073							165,073
Mountain Shrub		101,838							101,838
Sagebrush	4,573								4,573
Wet Meadow			101	242	560	234	597	836	2,570
High Elevation Riparian (blue spruce)			2,261	1,630	45	2,104	1,877	33	7,950
			3,396	8,226	2,416	8,848	16,192	6,590	45,668
Bristlecone Pine/Limber Pine		758	7,100	124,674	54,741	4,658	49,472	38,887	280,290
Douglas-fir			28,542	37,121	625	29,956	39,064	1,554	136,861
Lodgepole Pine		251	10,530	13,060	94	42,180	44,102	965	111,183
Pinyon/juniper		269	38,910	99,888	11,933	72,923	322,729	201,388	748,040
Ponderosa Pine									
Spruce/fir									
Total Acres	466,928	564,315	146,861	496,422	111,860	187,416	702,713	426,573	**3,103,088**

*As categorized for HABCAP modeling based on Hoover and Wills (1984).

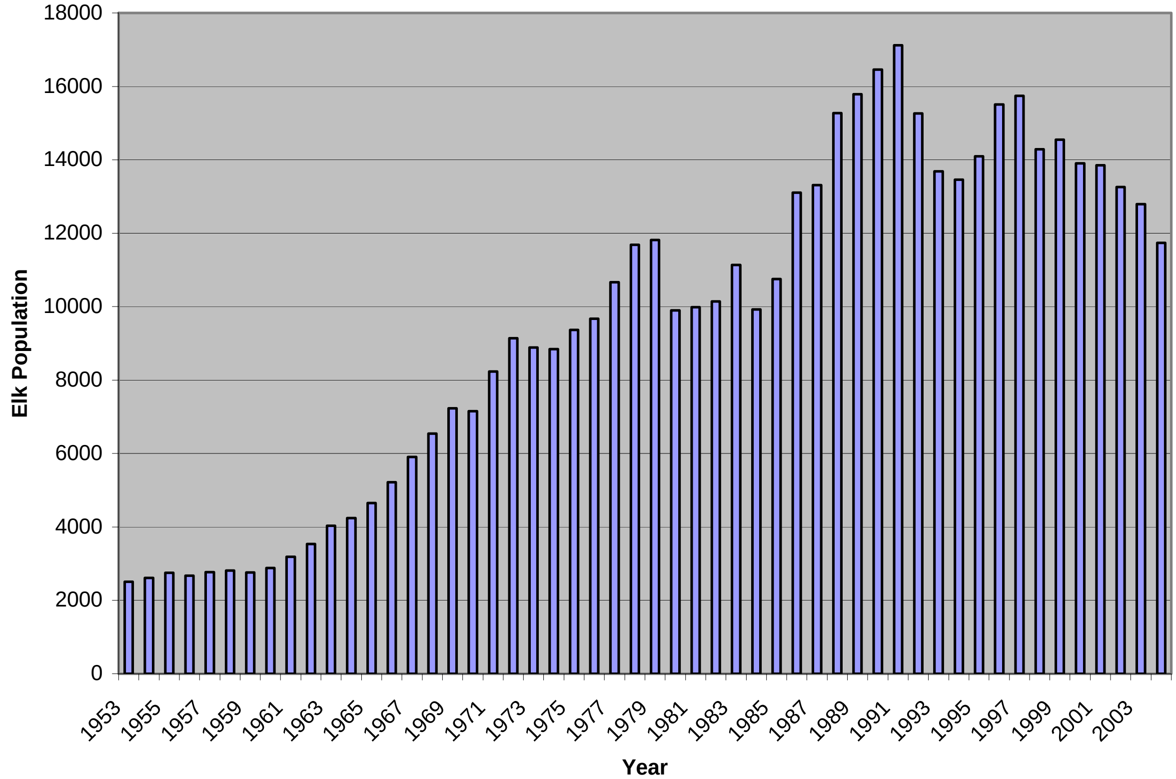


Figure E-1. Post-hunt elk population size of DAU E-14 from 1953 to 2004.

Table E-5. Population Objectives and Population Estimates

DAU	Game Management Units	Population Objective	Post Hunt Pop. Est. 2000	Post Unit 2004 Data
E-14	41,42,51,52,411,421,521	10,500*	13,906	11,738

*Population objective based on 1995 DAU Plan

The GMUG contains at least a portion of 11 DAUs. Population estimates for these DAUs (DAU 51estimates were not available) in 2003 totaled 154,290 animals. This represents an increase of approximately 16,830 over the 2002 estimates. Population estimates are available for these DAUs (except DAU 51) since 1980 and totals for all DAUs are presented in Table E-6.

Table E-6. Rocky Mountain elk population estimates for DAU's with acreage on the GMUG

Year	Population estimate	Year	Population estimate	Year	Population estimate
1980	45,854	1988	74,682	1996	71,507
1981	47,386	1989	77,998	1997	71,043
1982	50,918	1990	78,538	1998	65,566
1983	55,787	1991	77,291	1999	64,621
1984	50,320	1992	72,599	2000	58,753
1985	54,103	1993	68,259	2001	60,160
1986	63,337	1994	68,939	2002	58,330
1987	69,152	1995	70,520	2003	63,880

Estimated Effects

The potential for impacts to elk from enlarging Hunter Reservoir would be to the spruce/fir, subalpine grass/forb, willow/riparian components of their summer habitat, which would be approximately 88.8 acres (Table E-1). But since summer range is seldom the limiting factor in elk populations, this habitat removal should be a minor impact. The human activities and disturbance during construction would probably reduce the habitat effectiveness during that time, but this effect would be short-lived and not constitute a permanent change. No change in the local elk population would be expected as a result of the enlargement of Hunter Reservoir.

Cumulative Effects

Numerous land use actions (e.g., oil and gas activity, recreational activity, livestock grazing, road building, housing development, etc.) on State and private lands surrounding the Grand Mesa National Forest are reasonably certain to occur over the next several years. Where these activities fall within mature aspen, subalpine grass/forb, and spruce/fir, these land uses have the potential to affect elk through loss or degradation of summer range and production area habitat, direct mortality during construction activities, and/or displacement from habitats. While reservoir enlargement would have a minimal impact on the species, the potential for displacement during construction activities incrementally adds to overall impacts on elk likely to occur in the GMUG.

Summary

Because the affected habitats are used as summer range by elk, this project may temporarily displace or alter how individuals use afffected habitats through habitat alteration and/or disturbance, but these effects will not result in a change in population numbers or trends at the project or forestwide scales.

American Marten

Life History/Biology

The American marten is identified in the Forest Plan as a MIS. It is shown in Tables II-15 and II-16 (Forest Plan pp II-42-43) as a MIS associated with mature coniferous forest habitat, representing the highly specialized habitat requirements of other species or groups of species that use mature coniferous forest.

The Regional Forester of the Rocky Mountain Region of the FS also lists the American marten as a sensitive species. The Forest Plan includes standards and guidelines for management of habitat for the marten. These are summarized in Table E-7.

The American marten is a MIS for old growth spruce/fir forests on the GMUG. It is a medium sized member of the weasel family that prefers mesic, mature conifer forests with a complex physical structure near the ground (Watt et al. 1996). These features provide den sites, resting sites, and protection from predators and the elements. Denning and resting sites are found in live trees, snags, logs and root balls depending on the season (Watt et al. 1996). A portion of these structures must be large enough for rearing their young. In Maine, trees and logs of 40-cm dbh (15.7 inches) were preferred by marten for this purpose (Wynne and Sherburne 1984). Female

Table E-7. Forest objectives for American marten.

Management Activities	General Direction	Standards and Guidelines
Aquatic and Terrestrial Habitat Management	Manage for habitat needs of indicator species (FP III-24)	b. Pine marten (old growth spruce/fir): created openings should be less than 300 feet. in width. Provide diversity of forest communities.
	Manage habitat for viable population of all existing vertebrate wildlife species (FP III-26)	a. Maintain habitat capability at a level at least 40 % of potential capability.*
Diversity on National Forests and National Grasslands	Maintain structural diversity of vegetation on units of land 5,000 to 20,000 acres in size, or fourth-order watersheds, that are dominated by forest ecosystems.	c. In forested areas of a unit, 5-12% or more will (where biologically feasible) be in an old growth forest classification and must occur in irregular shaped patches. Designated spruce/fir and mixed conifer old growth patches shall be no smaller than 30 acres in size and should average 100-200 acres in size whenever possible…For every 10,000 acres of forest land capable of providing forest stands meeting old growth criteria, 500-1,200 acres of old growth will be evenly distributed throughout the unit. In addition, other stands within the same unit will be designated so that these stands will be managed on extended rotations in order to develop their old growth structure and values so that these stands will serve as old growth replacement stands.
	In forested diversity units, maintain an average of 200-300 snags (in all stages of development) per 100 acres, well distributed over the diversity unit (FP III-9b).	a. Snag dependent species must be maintained by providing habitat that will maintain minimum viable populations
		b. Maintain 10-20 tons of logs and other down woody material per acre for species dependent on this material for habitat.

*This standard and guideline varies with specific Management Area direction.

martens are more restricted than males to mature forests due to the rearing of young (Sadoway 1986). Mature forests provide a canopy cover (40-70% preferred) which reduces snow depth and moderates winter temperatures which are both important for marten survival (Watt et al. 1996). Subnivean spaces created by down woody debris are key for providing both adequate hunting terrain and insulation in the winter. Riparian and stream corridors are important for hunting and in defining home ranges (Spencer et al. 1983, Jones and Raphael 1990).

Marten home ranges often overlap. Male home ranges in the Western United States have been found to be from 0.8 km^2 to 4.9km^2 with female home ranges from 0.7km^2 to 3.4km^2 (Burnett 1981, Hawley and Newby 1957, Martin 1987, Spencer 1981). Male home ranges often overlap several female home ranges. Martens are not migratory although their home ranges can shift in size depending on the season (Jones and Raphael 1990).

Marten diets vary according to the season, sex, prey availability, and the geographic locale of the population. Food items include red-backed voles, red squirrels, mice, snowshoe hare, bird eggs, nestlings, insects, fish, young mammals, berries, wood fiber, lichen, and grass (Bull 2002). Larger prey items such as the snowshoe hare become more important during the winter months and increase in importance as winter progresses (Raine 1987, Thompson and Colgan 1994). Marten tend to hunt during the night in summer months and shift to daytime hunting activity in the winter.

Female marten are sexually mature at 15 months of age. They have delayed implantation and most breeding occurs in June and July. Female marten produce 1 litter per year with 1 to 5 kits (Strickland and Douglas 1987). Kits are born in March and April and stay with their mother until September or October when the juveniles disperse. Juveniles can disperse up to 40 to 60+ km (Strickland and Douglas 1987).

Habitat Requirements

American marten prefer and depend upon late-successional mesic conifer and mixed conifer stands (40-70% canopy cover) which become increasingly important during the winter months (Witmer et al. 1998, Lundrigan and Fillier 1995, Buskirk and Powell1994). Marten avoid conifer stands with less than 30% canopy cover in the winter (Koehler et al. 1975). An important component of these stands is down woody debris of appropriate density and size (dbh 15.7 inches preferred) to meet the marten's life requirements for denning and resting sites, thermal regulation, and hunting opportunities (Wynne and Sherburne 1984). Snags are used for resting and natal and maternal den sites (Wynne and Sherburne 1984, Jones and Raphael 1990). Marten are also associated with stream and riparian corridors that are adjacent to conifer stands. However, Lundrigan and Fillier (1995) found that marten strongly avoided scrub and bog areas. Several studies have reported marten using open areas during the summer months (Dice 1921, Grinnell et al. 1937, Marshall 1951, Streeter and Braun 1968, Koehler and Hornocker 1977, Soutiere 1979). In contrast, Spencer et al. (1983) found that marten avoided open areas year round. Others have found that marten use meadow edges readily.

Spencer et. al. (1983) found that marten used smaller-staged lodgepole pine for foraging but still retreated to old growth stands for resting. This tendency was also observed in riparian areas. Lodgepole pine stands overall are more useful to marten than meadows because they not only provide food but cover (Spencer et al. 1983). Extremely dense stands, which reduce herbaceous cover, were avoided by marten (Koelher et al. 1975, Spencer et al. 1983). The extent and arrangement of forest fragmentation can have a negative impact on marten. Forest stands with more than 25% non-forested cover have been found to be nearly devoid of marten. Forested landscapes with less than 100 meters between open patches ‘appeared unsuitable for marten’ (Hargis et al. 1999). Martens avoid large openings and clearcuts particularly in winter (Soutiere 1979, Clark and Cambell 1979, Stevenson and Majors 1982, Hargis and McCullough 1984). Openings within stands of suitable habitat should be less than 3 acres in size with less than 1 acre considered optimum. To meet marten habitat needs ‘core habitat areas’ should be 11.5-19 mi^2 (30-50 km^2) within which 75% of the core area contains suitable stands, and gaps of open area between core areas should not exceed 0.6-1.2 miles (1-2 km) across (Watt et al. 1996).

Based on the life cycle requirements and habitat use patterns of marten, Douglas-fir, spruce/fir and lodgepole pine stands classified by the forest’s Habitat Structural Stage, 4A, 4B, 4C and 5 would potentially meet optimal marten habitat needs. Other structural stages and vegetation types are used by marten on a less frequent basis as foraging habitat or as travel corridors to more suitable habitat.

Available Habitat on the GMUG

Forestwide habitat for American marten includes high elevation riparian, Douglas-fir, lodgepole pine, and spruce/fir for a total of 1,075,541 acres of potentially suitable marten habitat (Table E-8). Approximately 20 acres of mature spruce/fir forest will be affected by the enlargement of Hunter Reservoir and temporary improvements to the access road.

Table E-8. Potentially suitable habitat* for the American marten on the GMUG by vegetative cover type and habitat structural stage.

Cover Type	2	3A	3B	3C	4A	4B	4C/5	Totals
High Elevation Riparian (blue spruce)		101	242	560	234	597	836	2,570
Douglas-fir		3,396	8,226	2,416	8,848	16,192	6,590	45,668
Lodgepole Pine		7,100	124,674	54,741	4,658	49,472	38,887	279,532
Spruce/fir		38,910	99,888	11,933	72,923	322,729	201,388	747,771
Total Acres		49,507	233,030	69,650	86,663	388,990	247,701	**1,075,541**

*As categorized for HABCAP modeling based on Hoover and Wills (1984).

Population Information

Year-to-year fluctuations in population size of the American marten are common, and typically correlated with fluctuations in densities of small mammals (Weckwerth and Hawley 1962, Buskirk and Ruggiero 1994, Fryxell et al. 1999). No marten or their sign were observed by field biologists during field work in 2004-2006.

A 1996 amendment to the Colorado State Constitution that banned most trapping has eliminated or substantially reduced the mortality threat associated with trapping. This has lead to speculation by some biologists that marten populations are likely increasing.

Estimated Effects

Potential effects from reservoir construction and temporary access road improvements to marten habitat include the direct loss of denning/foraging habitat, disturbance due to construction activities, and possible direct mortality due to destruction of dens and collisons with vehicles and construction machinery.

Cumulative Effects

Numerous land use actions (e.g., oil and gas activity, recreational activity, livestock grazing, road building, housing development, etc.) on State and private lands surrounding the Grand Mesa National Forest are reasonably certain to occur over the next several years. Where these activities fall within mature spruce/fir, these land uses have the potential to affect marten through loss or degradation of marten habitat, direct mortality during construction activities, and/or displacement from habitats. While the reservoir enlargement, due to the small amount of potential habitat affected, would have a minimal impact on the species, the potential for displacement during construction activities and structural vegetation changes may incrementally add to overall impacts on marten likely to occur in the GMUG.

Summary

The enlargement of Hunter Reservoir and temporary improvements and relocation to the access road may temporarily displace or alter how individuals use affected habitats through habitat alteration and/or disturbance. Approximately 20 acres of spruce/fir (habitat) will be permanently removed, but this amount is small relative to the amount available in the Leon Creek drainage and on GMUG. Therefore, a determination of "**may adversely impact individuals, but the action is not likely to result in a loss of viability on the Planning Area, nor cause a trend to Federal listing or a loss of species viability rangewide"** was made in the Biological Evaluation for marten.

<u>Northern Goshawk</u>

Life History/Biology

The Northern goshawk is identified in the Forest Plan as a MIS. It is shown in Tables II-15 and II-16 (Forest Plan pp II-42-43) as a MIS associated with mature aspen forest habitat, representing the highly specialized habitat requirements of other species or groups of species that use mature aspen forest.

The Regional Forester of the Rocky Mountain Region of the FS also lists the northern goshawk as a sensitive species. A Biological Evaluation has been written for this project that evaluates the potential effects of the proposed action upon this species and other sensitive species relevant to the proposed action. The Forest Plan includes standards and guidelines for management of habitat for the northern goshawk. These are summarized in Table E-9.

Table E-9. Forest objectives for northern goshawk.

Management Activities	General Direction	Standards and Guidelines
Aquatic and Terrestrial Habitat Management	Manage for habitat needs of indicator species	e. Goshawk (mature aspen): provide 20% of pole or mature tree stands adjacent to nesting sites with at least 150 square feet of basal area. Provide at least one class 1 log adjacent to nesting sites.
		k. Deer, elk, black bear, goshawk: in areas of historic shortage of dry season water, where there is less than one source per section, create one source per section.
	Maintain habitat for viable populations of all existing vertebrate species.	a. Maintain habitat capability at a level at least 40% of potential capability.*
		b. No activities shall be allowed within ¼ mile of an active Ferruginous Hawk, Swainson's Hawk goshawk, osprey, or prairie falcon nest from March 1 to July 31 if they would cause nesting failure or abandonment.

*This standard and guideline varies with specific Management Area direction.

Habitat Requirements

In North America, northern goshawks occur in the mountains of the Eastern and Western United States, Alaska and Canada. In the western half of the United States goshawks winter in northern New Mexico/southern California, Texas and throughout its breeding range. They use a variety of boreal and montane forest habitats, which include coniferous, deciduous and mixed forests and vary as to specific species geographically (Johngard 1990, Reynolds et al. 1992, Squires and Reynolds 1997). All montane forest types are used in the west (Reynolds et al. 1982). In Colorado goshawk nests have been observed in quaking aspen (*Populus tremuloides*), ponderosa pine *(Pinus ponderosa*), lodgepole pine (*Pinus contorta*) and aspen/mixed conifer stands (Shuster 1980, Le Fevre 2004).

The majority of habitat information addresses nesting home range habitat. Nesting home ranges are considered to have 3 spatial components identified as: nest area, post-fledging family area (PFA), and foraging area.

Nest areas include one or more forest stands, several nests (usually within a few hundred yards of one another), several landform characteristics and range in size from 20-25 acres (8.09-10.12 ha) (Reynolds et al. 1992). Goshawks seem to prefer mature forests with open understories, a relatively closed canopy (60-90%) with large trees of moderate density (Speiser and Bosakowski 1987, Kennedy 1988, Reynolds et al. 1992, Daw et al.1998, Bosakowski 1999). Reynolds et al. (1992) stated that most nest stands are on slopes with a NW-NE exposure or encompass drainages or canyon bottoms. Nest trees may or may not have water nearby, may be located on a bench, moderate slopes (lower portion) or drainage bottom and often adjacent to a canopy break

(Shuster 1980, Reynolds et al. 1922, Hayward and Escano 1989, Squires and Reynolds 1997). Nests may be in snags or live trees and are constructed just below the canopy in the upper one third of the tree (Shuster 1980, Reynolds et al. 1982, Dick and Plumpton 1998). Though not typical for many areas, snag nesting is common in the Ashley National Forest in Utah. The nest tree is usually the largest or one of the largest trees in the nest stand. Based on Bosakowski's (1999) summary table (Table E-11) for nesting habitat in North America, average nest tree dbh range was 12.4 – 35.8 inches (31.6 - 91 cm) (n= 171), nest tree stand average dbh range was 8.6 – 22.8 inches (22 – 58 cm) (n=156) and average basal area range was 124.2 – 392.2 ft^2/acre (28.5 – 90 m^2/ha) (n=128) for multiple habitat types across 5-7 the western states. High canopy closure and tree basal area were the most uniform characteristics in nest areas between study sites in northern Idaho and western Montana (Hayward and Escano 1989). In a northern Colorado study based on 20 nests (10 in aspen), nest site preferences were as follows: basal area in aspen was 99-152, understory sparse or none, nests seldom farther than 902 feet (275 m) from water (not loud running water), gentle north and east facing slopes or benches and nest elevation was seldom lower than 7,546 feet (2,300 m). Nest tree dbh was 9.8 inches (25 cm) or greater in aspen (Shuster 1980).

The PFA surrounds the nest area. The PFA is used by the young from when they leave the nest until the young are no longer dependant on the parents (Reynolds 1992, Kennedy 1989). PFAs range in size from 300-600 acres (121.4-242.8 ha) (Reynolds et al. 1992). Reynolds describes PFA habitat as similar to the nest area habitat though it includes a variety of forest conditions. He suggests the PFA should contain: an overstory of >50% canopy closure with a well developed understory, a mosaic of vegetative structural stages with 60% being mature stages of growth, 20% young forest, 10% seedling/sapling, and 10% grass/forb/shrub stage, with woody debris throughout, centered around nesting habitat and provide prey and hiding cover for fledglings.

Reynolds (1983) and Kennedy (1989) estimated goshawk nesting home ranges to be 5,000 – 6,000 acres (2,023-2,428 ha). Foraging habitat (within the nesting home range) has been defined in a number of ways in various studies. Studies suggest goshawks use all forest types but for hunting, select forests with high basal area, high density of large trees, a high canopy closure, and relatively open understories i.e. mature/old growth (Hargis et al. 1994, Beier and Drennan 1997). Researchers have observed goshawks hunting along edges, clearcuts and openings but it is not known how important these habitats are for goshawk foraging (Shuster 1980, Kenward 1982). Beier and Drennan (1997) found that foraging sites were selected by radio-tagged goshawks based on favored habitat structure rather than local prey abundance. Bosakowski (1999) feels that based on the studies to date, most hunting occurs in habitat similar in structure to that selected for nest sites. It has been recommended that desired foraging habitat should be 5,400 acres (2,185.3 ha) (not including any openings, PFA and nest site), surround the PFA and contain the same structural stages and characteristics as those for PFA habitat (Reynolds et al. 1992).

Limited information is available concerning goshawk winter habitats/home ranges. Many goshawks winter on their breeding home ranges (Squires and Reynolds 1997). On the average, winter ranges are larger than breeding ranges (Kennedy 2003). Based on 12 goshawks studied in Utah, winter range size was 2,471 – 19,644.8 acres (1,000-7,950 ha). Recent research on goshawk winter habitat use indicates that wintering birds will use habitat not used for nesting, i.e. pinyon-juniper woodland (Drennan and Beier, in press).

On GMUG, 110 active, alternate or suspected goshawks nests have been found in mature (4B, 4C habitat structural stage, HSS) aspen, aspen/mixed conifer, ponderosa pine, Douglas-fir and lodgepole pine stands (Table E-10). Based on the data for the 110 nests, nest site preference is for larger aspen trees. Average nest site characteristics for aspen are: dbh – 14.7 inches (37.3 cm), canopy cover – 64%, slope around the nest site – 10% and elevation range – 8,480-10,720 feet (2,584-3,213 m). Table E-10 summarizes the nest site characteristics for nest tree species across the forest (Le Fevre 2004).

Table E-10. Goshawk Nest Site Characteristics on the GMUG

Goshawk Nest Tree	Mean DBH (inches)	Mean Tree Height (feet)	Mean Nest Height (feet)	Mean Elevation (feet)	Mean Canopy Closure	Mean Slope
Aspen	14.7 range: 9-28 n=73	70 range: 44-97 n=74	49 range: 26-68 n=75	9,352 range: 8,480-10,642 n=100	64% range: 15%-100% n=78	10% 1%-45% n=70
Ponderosa Pine	16.5 range: 16-17 n=2	63 range: 55-69 n=2	45 range: 40-50 n=2	9,508 range: 8,480-10,642 n=2	46 % range: 37%-55% n=2	24% range: 1%-45% n=70
Lodgepole Pine	11.8 range: 9-15 n=5	62 range: 55-69 n=5	36 range: 28-50 n=5	10,118 range; 9,650-10,720 n=6	68% range: 50%-92% n=5	16% range: 10%-19% n=5
Douglas Fir	12 range: 10-14 n=2	57 range: 50-63 n=2	39 range: 35-42 n=2	9,290 range: 9,060-9,520 n=2	65% range: 65% n=2	8% range: 7%-9% n=2

Small aspen stands surrounded by conifer and/or mixed conifer/aspen stands made up 86% of nest sites, 14% of nests were in lodgepole pine stands. Elevation range for nest trees was 9,240 – 10,720 feet (2,816-3,267.4 m). The average characteristics for all species of nest trees were: dbh - 13.5 inches (34.3 cm), nest tree height – 72.5 feet (22.1 m), nest height – 45.7 feet (13.9 m), slope – 17.1 degrees and estimated canopy cover – 91.7%. Nest trees were located on all aspects except north to northeast. The elevation range for all goshawk observations on the GMUG is 8,800-10,800 feet (2,682.2-3,291.8 m).

Preferred nesting habitat within the project area is highly associated with mature and old growth aspen, mixed aspen and spruce-fir, and spruce/fir with remnant aspen trees. Nesting and post-fledging habitat areas are most dependent upon large continuous blocks of mature or old growth forest. A single nesting territory may contain several alternate nests. The same nest may be used for several seasons by the nesting pair. Nesting goshawks are particularly sensitive to disturbance, and repeated activities adjacent to nesting birds can result in abandonment of the nest.

Forestwide habitat for Northern Goshawk includes all the above habitat types for a total of 2,632,782 acres of potentially suitable goshawk habitat. These acres include both potential summer and winter habitat for goshawk (Table E-11).

Table E-11: Potentially suitable Northern Goshawk habitat* on the GMUG by vegetation cover type and habitat structural. Stage

Cover Type	1	2	3A	3B	3C	4A	4B	4C/5	Totals
Aspen		4,743	55,301	211,399	41,446	23,567	227,148	176,278	739,881
Cottonwood Riparian			248	100		2,530	1,532	42	4,452
Gambel Oak		291,383	472	82		416			292,353
Mountain Shrub		165,073							165,073
Sagebrush		101,838							101,838
Wet Meadow	4,573								4,573
High Elevation Riparian (blue spruce)			101	242	560	234	597	836	2,570
Douglas fir			3,396	8,226	2,416	8,848	16,192	6,590	45,668
Lodgepole Pine		758	7,100	124,674	54,741	4,658	49,472	38,887	280,290
Pinyon-juniper			28,542	37,121	625	29,956	39,064	1,554	136,861
Ponderosa Pine		251	10,530	13,060	94	42,180	44,102	965	111,183
Spruce-fir		269	38,910	99,888	11,933	72,923	322,729	201,388	748,040
Total Acres	4,573	564,315	144,600	494,792	111,815	185,312	700,836	426,540	2,632,782

*Potentially suitable habitat derived from HABCAP modeling based on Hoover and Wills (1984).

Within the project area, there are approximately 20 acres of potential nesting habitat (spruce/fir) which will be removed by construction of the enlarged Hunter Reservoir and temporary improvements to the access road.

Population Information

Within the GMUG MIS assessment (2005), known locations of goshawk nest sites, suspected breeding territories (evidence of goshawk breeding is present but nest sites have not been located), and goshawk sightings are documented for the Forest. Locations date from 1984 to 2003 with a few goshawk nests known from the 1970s. Based on actual known locations of nest sites, suspected breeding territories, and sightings, the Northern goshawk appears to be well distributed throughout the GMUG in suitable habitat (primarily mature aspen and mixed aspen/conifer forest). On the GMUG, goshawk surveys are most often conducted in areas proposed for FS projects, especially those that would change mature forest habitats. In many locations on the GMUG, such as wilderness areas, high quality goshawk habitat has never been surveyed for breeding territories due to the priority of doing surveys in areas proposed for forest management.

Records of known goshawk nest activity on the GMUG show that numbers of breeding goshawks and nest success (the young have fledged) have remained relatively stable, although low, over a 17-year period. Although the records show that the vast majority of known goshawk territories have been inactive in any given year, a strong caution must be used when calling a territory inactive when not all of the alternate nest sites are known. Goshawks use alternative nests within their breeding territory in alternative years. When only a single nest or two nests are known in a breeding territory, which is more common than not on the GMUG, it is highly likely that there are alternate nests in unknown locations within the same territory and one of these nests may be active. When there is evidence of an adult goshawk in the territory during the breeding season (March 1-September 30), even if an active nest is not known, the assumption is that the territory is active. Even if the nest has failed, the territory has been active at some point during that year (nest building/maintenance and courtship occurred, eggs likely were laid, and then the nest failed at some later date). If a fledgling is located within the territory prior to September 30, it is assumed that the fledgling was produced in that territory, even if an active nest is not known, and the territory is active. After September 30, fledglings often disperse from the breeding territory and this assumption may no longer be valid.

Estimated Effects

There are no known goshawk territories in the Leon Creek Drainage, and no individuals were noted during field work in 2004, 2005, or 2006. Calling surveys were conducted in July 2006, and no responses were documented.

Potential effects from reservoir construction and temporary access road improvements to goshawk nesting habitat include the direct loss of the primary or alternate nest trees, disturbance to nesting birds, and loss of interior forest habitat conditions. Nest site searches will be conducted annually until construction begins. Timing restrictions could be placed upon construction activities if surveys confirm nesting in the area.

Cumulative Effects

Numerous land use actions (e.g., oil and gas activity, recreational activity, livestock grazing, road building, housing development, etc.) on State and private lands surrounding the Grand Mesa National Forest are reasonably certain to occur over the next several years. Where these activities fall within mature aspen and spruce-fir, these land uses have the potential to affect Northern goshawk through loss or degradation of habitat, direct mortality during construction activities, and/or displacement from habitats. While the reservoir enlargement would have a minimal impact on the species, the potential for displacement during construction activities and structural vegetation changes may incrementally add to overall impacts on northern goshawk likely to occur in the GMUG.

Summary

Enlargement of Hunter Reservoir would remove approximately 20 acres of potential nesting habitat. However, this amount is small relative to that available in the Leon Creek drainage and on GMUG. Therefore a finding of **"may adversely impact individuals, but the action is not likely to result in a loss of viability on the Planning Area, nor cause a trend to Federal listing or a loss of species viability rangewide"** is made in the Biological Evaluation.

Red-naped Sapsucker

Life History/Biology

The red-naped sapsucker was identified as a MIS in the 2005 Forest Plan Amendment for its relationship with aspen habitat, particularly mature stands of pure aspen associated with riparian areas containing a willow component. The red-naped sapsucker is closely associated with pure aspen stands for cavity nesting and they create sap wells in both aspen and willow for foraging.

The red-naped, yellow-bellied, and red-breasted sapsuckers collectively were long treated as forms of a single species, the yellow-bellied sapsucker, until 1983 when systematic studies showed distinctions sufficient to warrant taxonomic treatment as separate species (Walters et al. 2002). Although the biology of these three species appears to be quite similar, evidence from distribution, ecology, plumage, assertive mating, and genetics support treating this complex as three distinctly separate species making up the super species *Sphyrapicus varius* (Short 1969, 1982; Cicero and Johnson 1995; Walters et al. 2002). Hybridization is known to occur among these three species where their ranges overlap, and hybrids between red-naped and Williamson's sapsuckers (*S. thyroideus*) have been documented (Walters et al. 2002).

The red-naped sapsucker breeds throughout the Rocky Mountains from British Columbia to southern New Mexico. The GMUG is well within the breeding distribution range of the red-naped sapsucker. Throughout western and central Colorado, they breed regularly within deciduous woodlands, especially where deciduous woodlands are associated with riparian areas that contain a willow component. On the GMUG, red-naped sapsuckers are associated with mature aspen forests, mature aspen and conifer mixes, and aspen riparian areas with a willow component.

Red-naped sapsuckers are primarily a short-distance migrant. They move south from their breeding range into Mexico, Baja California, southern California, Arizona, and New Mexico, although some individuals winter within their breeding range in Arizona and New Mexico (Walters et al. 2002). In Colorado, transient red-naped sapsuckers establish feeding territories during March in pinyon-juniper habitats before moving to breeding grounds at higher elevations in early April (Hadow 1977). The timing of territory establishment and pair formation may be delayed by colder than average temperatures or other inclement weather (Walters et al. 2002). Pair formation and nest excavation typically begins within three weeks of arrival to the breeding grounds (Hadow 1977). Following territory establishment and pair formation, the nesting season extends from mid or late April to early August, with most nesting activity concentrated between mid-May to mid-July in Colorado (Hadow 1977, Walters et al. 2002). Fall migration takes place from early August to late October, typically peaking in September (Campbell et al. 1990, Gilligan et al. 1994, Walters et al. 2002). In Colorado, transient red-naped sapsuckers usually exhibit movements to lower elevations in pinyon pine-juniper habitats by early September (Hadow 1977) before migrating to winter ranges.

In early spring, the red-naped sapsucker feeds primarily in sap wells that they create in the xylem of trunks or stems of conifer trees, including Rocky Mountain juniper, Douglas-fir, lodgepole pine, and ponderosa pine. Xylem sap wells are characterized by a series of parallel circular holes that usually completely surround a stem or trunk (Walters et al. 2002). Once deciduous trees and shrubs leaf out, the red-naped sapsucker preferentially forages among aspen and cottonwood stands associated with willow riparian areas. During the breeding season, this species creates sap wells that tap the phloem tissue of stems or tree trunks, predominantly in aspen and willow vegetation, and less frequently in cottonwood riparian. Phloem sap wells are characterized by a rectangular shape and typically surround an aspen trunk or willow stem.

Although red-naped sapsuckers are specialized for sipping sap, their diet also includes insects, inner bark, fruit and seeds (Walters et al. 2002). This species feeds on aspen buds and has been observed fly-catching exclusively in aspen and gleaning insects from aspen, Douglas-fir, and cottonwood. During the breeding season, the red-naped sapsucker spends the majority of its time maintaining sap wells and searching for insects to feed nestlings (Walters et al. 2002). Adults often crush prey and sometimes mix insects with sap prior to feeding young (Wible 1960). Juvenile sapsuckers are capable of foraging on their own soon after they leave the nest (Tobalske 1992).

Red-naped sapsuckers are apparently monogamous, with pair bonds maintained through the breeding season and usually re-established between years if mates survive (Walters et al. 2002). Mate fidelity may be attributable to general nest site fidelity; red-naped sapsuckers even reuse nest trees in subsequent years (Walters et al. 2002). Pair formation and nest excavation begins within three weeks of arrival to the breeding grounds, typically in early to mid-April. Nest sites may be chosen based on their proximity to suitable foraging habitat rather than on the characteristics of the nest stand itself (Crockett and Hadow 1975). Initially the male performs most of the cavity excavation with female participation increasing as the season progresses. Cavity excavation varies from six days to four weeks (Howell 1952, Walters 2002).

Red-naped sapsuckers raise only one brood per season, although pairs sometimes renest if the first nest fails (Walters et al. 2002). In a study conducted at Hat Creek, British Columbia, Walters et al. (2002) reported that mean clutch size was significantly larger in old cavities than mean clutch size in new cavities. The point at which incubation begins for red-naped sapsuckers is unknown, although Walters et al. (2002) assumes that incubation begins on the day that the last egg is laid. Incubation is estimated to last approximately eight to twelve days (Walters et al. 2002) with both parents incubating, although the male likely does most of the incubating (Short 1982). In Colorado, Hadow (1977) recorded red-naped sapsuckers chick hatching in early June and fledging during the second week of July. On the Flathead National Forest in northwestern Montana, Tobalske (1992) reported that adults were most active and the juveniles most vocal two weeks prior to fledging.

Habitat Requirements

Nesting red-naped sapsuckers require aspen groves with two characteristics: aspen trees infected with shelf or heartwood fungus (for drilling nest holes) and nearby willow carrs (for drilling sap wells). They reject aspen groves that lack nearby willow riparian habitat. On the GMUG, red-naped sapsuckers are primarily associated with mature aspen forests, mature aspen and conifer mixes, and aspen riparian areas with a willow component.

On the GMUG, the abundance and distribution of the red-naped sapsucker is largely tied to the availability of deciduous woody vegetation, especially aspen and willows. This species is dependant on aspen stands or the aspen component of mixed stands for nesting and summer foraging, particularly when these habitat types occur in or adjacent to riparian areas. Primary habitat includes areas dominated by aspen, cottonwood, and willow vegetation, encompassing approximately 26% (825,720 acres) of the GMUG. Secondary habitat consists of approximately 21% of the GMUG (704, 772 acres) and is comprised of Douglas-fir, lodgepole pine, and ponderosa pine (both pure stands and stands with an aspen component), in addition to immature (3A, 3B, and 3C) stands of both aspen and cottonwood. Table E-12 summarizes acres of red-naped sapsucker habitat by habitat quality on the GMUG.

Forest-wide habitat for the red-naped sapsucker includes all of the above cover types for a total of 1,530,492 acres of potentially suitable habitat. The preferred nesting habitat, mature aspen with nearby willow stands, is not found near Hunter Reservoir. However, some habitat may be found along the access road below the East Leon Creek crossing.

Population Information

The red-naped sapsucker is considered globally “secure” by the Natural Heritage Program due to its wide distribution across North America. According to the Breeding Bird Survey (BBS), populations appear to be stable to increasing in the United States, with areas of local declines. Local declines may be related to a loss of cottonwood and aspen nesting habitats. Based on BBS trend data for the period 1966 to 2004, red-naped sapsuckers have exhibited a significant positive population trend of 4.34%. However, BBS trend estimates may be confounded by recent changes in sapsucker taxonomy splitting the red-naped from the yellow-bellied sapsucker.

Within the state of Colorado and the Southern Rockies physiographic region, red-naped sapsucker populations have exhibited similar upward trends, exceeding national trends.

Table E-12. Habitat parameters for modeling Red-naped Sapsucker habitat on the GMUG

Habitat Parameter	Habitat Quality		Vegetation Cover Type	Habitat Structural Stage							Habitat Acres
				2	3A	3B	3C	4A	4B	4C	
SUMMER COVER AND NESTING	Primary	High	Aspen					X	X	X	426,993
			Cottonwood					X	X	X	4,104
			Willow	X							86,129
	Secondary	Marginal	Aspen		X	X	X				308,146
			Cottonwood		X	X	X				348
			Douglas-fir/aspen mix					X	X	X	31,629
			Lodgepole pine/aspen mix					X	X	X	93,017
			Ponderosa pine/aspen mix						X	X	45,067
		Low	Douglas-fir/aspen mix		X	X	X				14,038
			Lodgepole pine/aspen mix		X	X	X				186,515
			Ponderosa pine/aspen mix		X	X	X	X			65,864
SUMMER FEEDING	Primary	High	Aspen		X	X	X	X	X	X	735,139
			Cottonwood		X	X	X	X	X	X	4,452
			Willow	X							86,129
	Secondary	Marginal	Douglas-fir		X	X	X	X	X	X	45,668
			Lodgepole pine		X	X	X	X	X	X	240,645
			Ponderosa pine		X	X	X	X	X	X	109,966

Red-naped sapsuckers have been detected on nine BBS routes on the GMUG, with insignificant negative trends observed on three out of four routes within the Uncompahgre Plateau Geographic Area, a significant positive trend observed within the North Fork Valley and Grand Mesa Geographic Areas, and positive upward trends observed on three routes within the Gunnison Basin Geographic Area, one which was significant. Single site analysis on BBS routes within the GMUG may not be statistically valid due to low sample sizes and the amount of suitable Red-naped sapsucker habitat sampled by the routes: from 1966 to 2004, only 0.92% (6,806 acres) of all aspen habitat on the Forest (739,882 acres) was sampled by the BBS.

On the GMUG, from 1998 to 2004, Monitoring Colorado’s Birds (MCB; a program implemented by the Rocky Mountain Bird Observatory) detected 186 red-naped sapsuckers on 25 transects, primarily in aspen and high elevation riparian dominated habitat types. Interestingly, 62% of all red-naped sapsuckers observations throughout the MCB survey were on the GMUG. Based on MCB data, red-naped sapsuckers appear to be in an upward trend for transects that occur on the GMUG; average number of red-naped sapsuckers per transect range from 2.2 birds in 2001 to 4.15 birds in 2004.

During field work in 2005 and 2006, nesting individuals were observed regularly in the aspen stands north of Hunter Reservoir, but no sightings were made within 1 mile of the reservoir, presumably due to absence of preferred habitat.

Estimated Effects

Within the Leon Creek drainage, the red-naped sapsucker primarily utilizes forests of mature aspen and aspen/conifer in structural stages 4A, 4B, and 4C/5 (mature to old growth with varying percentages of cover) that are in close proximity to stands of willow. Mature and old growth forest habitat contain key habitat elements for cavity nesting species. The red-naped sapsucker utilizes the numerous snags or live trees with damage or rot for nest trees. These trees are easier to excavate cavities in than sound, hard snags and live trees. Insect activity is also normally associated with snags, damaged trees, and down logs. Secondary habitat includes the younger stands of aspen and aspen/conifer in structural stages 3A, 3B, and 3C. Very little habitat is present near Hunter Reservoir.

Cumulative Effects

Numerous land use actions (e.g., oil and gas activity, recreational activity, livestock grazing, road building, housing development, etc.) on State and private lands surrounding the Grand Mesa National Forest are reasonably certain to occur over the next several years. Where these activities fall within mature aspen and spruce-fir, these land uses have the potential to affect red-naped sapsucker through loss or degradation of aspen, willow and mixed conifer habitat, direct mortality during construction activities, and/or displacement from habitats. While the Proposed Action would have a minimal impact on the species, the potential for displacement during harvest activities may incrementally add to overall impacts on red-naped sapsucker likely to occur in the GMUG.

Summary

Due to the small amount of habitat affected relative to that available in the Leon Creek drainage, the project may temporarily displace or alter how individuals use affected habitats through habitat alteration and/or disturbance, but these effects will not result in a change in population numbers or trends at the project or forestwide scales.

Common Trout: Colorado River Cutthroat, Rainbow , Brown and Brook Trout

Life History, Biology and Habitat Requirements

The Regional Forester of the Rocky Mountain Region of the FS also lists the Colorado River cutthroat trout as a sensitive species. A Biological Evaluation has been written for this project that evaluates the potential effects of the proposed action upon this species and other sensitive species relevant to the Proposed Action. The Forest Plan includes standards and guidelines for management of habitat for the Colorado River cutthroat trout as well as the rainbow, brown, and brook trout. These are summarized in Table E-13.

Table E-13. Forest objectives common trout

Management Activities	General Direction	Standards and Guidelines
Aquatic and Terrestrial Habitat Management	03 Inventory aquatic habitat associated with perennial streams on the forest. Maintain aquatic habitat in at least its current condition with stable or improving trends. Improve aquatic systems to an over-all upward trend. 04 Manage habitat for needs of macroinvertebrate and fish indicator species on all perennial streams which provide potential fisheries. Manage waters capable of supporting self-sustaining trout populations to provide for these populations. 05 Prioritize streams for intensive management based on their current condition and ability to support self-sustaining trout populations.	f. Maintain fisheries habitat at a level which reflects an improving trend. c. Manage stream habitat to improve habitat conditions. If alternatives to management activities which cause unfavorable conditions cannot be developed, then mitigation measures will be included in project proposals.
Wildlife and Fisheries Threatened, Endangered, and Sensitive Species	Manage for and provide habitat for threatened, endangered and sensitive species as specified in the Region Forester's 1920 letter dated June 25, 1982.	c. Delineate and manage habitat for CRCT as part of the State's recovery plan for de-listing the species.

Four trout species are used to measure and monitor the health management status of the forest aquatic resources. This group includes one native inland cutthroat trout of special interest, the Colorado River cutthroat (CRCT), *Oncorhynchus clarkii pleuriticus*, a species of special concern in Colorado. The others are non-native salmonids threatening the continued existence of CRCT, as they can out compete and/or hybridize with CRCT.

CRCT's originally inhabited streams and lakes of the upper Colorado River basin (Fuller 2006a), including Leon Creek. Streams with moderate gradients, streambank shading and undercuts, and that have a gravel substrate for spawning are required. Suitable fingerling habitat is generally found where there is an abundance of spawning gravel and narrow stream widths. Some studies have found spawning habitat to be the limiting habitat feature for CRCT (Young 1995). They are less resilient than other salmonids in the common trout group with a minimum population doubling time of 4.4-14.5 years. The other three salmonids in this group are more resilient with minimum population doubling time of 1.4-4.4 years (Froese and Pauly 2006).

Rainbow trout native range is the Pacific Slope from Kuskokwim River, Alaska, to (at least) Rio Santa Domingo, Baja California; upper Mackenzie River drainage (Arctic basin), Alberta and British Columbia; endorheic basins of southern Oregon. Beginning in the late 1800s, there have been many stockings of this species for sportfishing purposes by state and federal agencies and by private individuals, mostly into streams and spring branches (Fuller 2006b).

The natural habitat of the species is fresh water with about 12°C in summer. They require moderate to fast flowing, well oxygenated waters for breeding, but they also live in cold lakes. Spawning occurrs in spring. Adults feed on aquatic and terrestrial insects, mollusks, crustaceans, fish eggs, minnows, and other small fishes (including other trout); young feed predominantly on zooplankton in lacustrine environments (Froese and Pauly 2006).

Rainbow trout hybridizes with other, more rare trout species, thereby affecting their genetic integrity. In the Lahontan drainage and various Rocky Mountain rivers, hybridization with rainbow trout has been a major factor in the decline of native cutthroat trout. Rainbow trout have replaced Lahontan cutthroat trout in areas where the cutthroat is native and rainbow trout have been introduced. Introduced rainbow trout, and other trout species, were likely responsible for the near-extinction of Lahontan cutthroat in Lake Tahoe in the 1940s.(Fuller 2006b).

Brook trout are fairly resilient with a minimum population doubling time 1.4 - 4.4 years. They are distributed throughout North America and most of Canada. Habitat needs are clear, cool, well-oxygenated creeks, small to medium rivers, and lakes. In its native range, general upstream movements have been observed in early spring, summer and late fall; downstream movements, in late spring and fall. Brook trout feed on a wide range of organisms including worms, leeches, crustaceans, insects, mollusks, fishes and amphibians (Froese and Pauly 2006)

In Black Hollow Creek, near Fort Collins, Colorado, stocked brook trout completely replaced greenback cutthroat trout, *O. clarki stomias* within a period of five years (Behnke 1992). Brook trout also have replaced Lahontan cutthroat trout *O. c. henshawi* in areas where the cutthroat is native and brook trout have been introduced. Introduced brook trout, and other trout species, were likely responsible for the near-extinction of Lahontan cutthroat in Lake Tahoe in the 1940s (Fuller 2006d).

Introduced in April 1883 in the Pere Marquette River, Michigan by the US Fish Commission, brown trout prefer cold, well-oxygenated upland waters although their tolerance limits are lower than those of rainbow trout and favor large streams with adequate cover in the form of submerged rocks, undercut banks, and overhanging vegetation. Juveniles feed mainly on aquatic and terrestrial insects; adults on mollusks, crustaceans and small fish (Froese and Pauly 2006, Fuller 2006c).

Brown trout have been implicated in reducing native fish populations (especially other salmonids) through predation, displacement, and food competition. Many studies have been conducted looking at the effects of brown trout on brook trout. Taylor et al. (1984) list a number of papers citing the effects of brown trout on native fishes. Another author stated adult brown trout displaced adult native brook trout from the best habitats in a Michigan stream, and in the northeast in general. Brook trout are also more susceptible to angling and predation. The competitive advantage of the two species may change with size, age, temperature, stream size, or environmental adaptations of different populations. Brown trout have commonly replaced cutthroat trout in large rivers (Behnke 1992). One study specifically lists Lahontan cutthroats as being replaced by brown trout. According to others, introduced brown trout and other trout species were likely responsible for the near-extinction of Lahontan cutthroat in Lake Tahoe in the 1940s. The State of California has attempted to eradicate brown trout in some areas in order to preserve native golden trout, *O. aguabonita* (Fuller 2006c).

Available Habitat & Population Information

The GMUG LRMP Amendment for MIS species (2005) has identified the assemblage of "common trout" to evaluate management affects to aquatic ecosystems. A review of forest-wide fish sampling on the GMUG indicates that trout are widely distributed throughout the forest. Statistics from the GMUG LRMP suggests that there are approximately 1,200 miles of stream on the forest that contain viable fish populations of brook, rainbow, brown, and cutthroat trout. A total of 80 sites have been sampled on the GMUG since 2001, revealing that trout density ranges between 12 and 2,794 fish per mile, with a mean density of 589.8 fish per mile. CDOW records and field observations in 2005 and 2006 confirm that only CRCT is present in and adjacent to Hunter Reservoir. Rainbow and brook trout are found elsewhere in the Leon Creek drainage. Brown trout are not present.

Estimated Effects

Althought CRCT, rainbow, brook and brown trout are salmonids and all are popular with anglers, the most sensitive species of the group is CRCT.

Direct Effects: Short term disturbances for road and dam construction will release suspended sediment even though implementation of best management practices for erosion and stormwater control will keep those releases to a minimum. Long term the installation of best management practices on the road and improvements in the dam spillway will reduce overall sediment releases in the watershed. Althought the enlarged reservoir would only spill about 50% of the time, E. Leon Creek is a rapid water gaining basin and if suitable spawning habitat remains unaffected (Young 1995), CRCT total numbers and biomass should not be affected. Proposed discharges will enhance CRCT habitat during releases. The annual hydrograph will have the same shape but will peak slightly later in the spring.

The enlarged reservoir will have a significantly larger, deeper conservation pool of water (37 acre-feet). Over winter survival of fish will be enhanced. Potential for spawning habitat improvement in the sub-basin with perrenial flows of 1-2 cfs could re-establish an adfluvial population of CRCT which, according to Young et al. (1996) have a great history of success.

Indirect Effects: The long term disturbance of increased use of the existing roads and use of an upgraded road required to access the construction site could result in increased exploitation of fisheries by anglers.

Cumulative Effects

Numerous land use actions (e.g., oil and gas activity, recreational activity, livestock grazing, road building, housing development, etc.) on State and private lands surrounding the Grand Mesa National Forest are reasonably certain to occur over the next several years. These land uses have the potential to affect trout through sedimentation of the streams and lakes, which affects the water quality needed by trout. Water temperature could also be affected by the reduction of shading vegetation. While the reservoir enlargement would have a minimal impact on the species, the potential for water quality changes during construction activities may incrementally add to overall impacts on trout likely to occur in the Leon Creek drainage and on the GMUG.

Summary

During construction, the existing CRCT population within Hunter Reservoir could be adversely impacted. If downstream flows are reduced or water quality degraded by construction, downstream populations could also be adversely impacted. Therefore a finding of "**may adversely impact individuals, but is not likely to result in a loss of viability on the Planning Area, nor to cause a trend towards Federal listing or a loss of species viability rangewide"** was made for the Colorado River cutthroat trout in the Biological Evaluation. However, post-construction impacts are likely to be positive due to creation of a larger body of water which should support a larger population than the current reservoir. The larger reservoir should also improve downstream habitat by moderating stream flow fluctuations. The other three common trout species should not be impacted due to their absence from the area.

III. FOREST PLAN CONSISTENCY

GMUG Land and Resource Management Plan assigns the Hunter Reservoir project analysis area a Management Prescription of 6B with emphasis on maintaining soil and vegetation condition and providing forage for livestock production. The project is expected to meet the following prescription direction (III-145-150):

- Manage for livestock grazing, using intensive grazing systems and managing for mid-seral range conditions in the area of Hunter Reservoir.
- Design and implement management activities to blend with the natural landscape.
- Dispersed recreational opportunities vary between semi-primitive non-motorized and roaded natural experiences ½ mile from the road, depending on the type of road surface.
- Motorized vehicles are restricted to roads where needed to protect soils, vegetation and special wildlife habitat.
- Provide adequate forage to sustain big-game population levels as stated in the Statewide Comprehensive Wildlife Management Plan.
- Manage forests to provide a high level of forage production, wildlife habitat and diversity.

The enlargement of Hunter Reservoir and temporary improvements to the access road will not violate the Forest standards and guidelines listed for any MIS described above. In the case of common trout, the enlarged reservoir, by moderating stream flows, may be expected to enhance habitat conditons.

Project Design Criteria, Mitigation Measures, and Monitoring

Project design criteria, mitigation measures and monitoring requirements are described within this Draft Environmental Impact Statement. These requirements are designed to promote attainment of the desired conditions and objectives for MIS identified in the Forest's Amended

Land and Resource Management Plan and to comply with the travel management policies prescribed in the Grand Mesa Travel Management Plan as Amended December 2003.

All GMUG 1991 Forest Plan wildlife standards and guidelines have been reviewed, along with the design criteria and mitigation measures in place for the Hunter Reservoir enlargement project. The project is consistent with the Forest Plan for all MIS that potentially occur in the project area.

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Department of Agriculture
Forest Service
Grand Mesa, Uncompahgre and Gunnison National Forests

HUNTER RESERVOIR ENLARGEMENT DRAFT ENVIRONMENTAL IMPACT STATEMENT

Appendix F
Biological Evaluation

Hunter Reservoir Enlargement

Biological Evaluation

Grand Mesa, Uncompahgre and Gunnison National Forest

Prepared by:

Name: Date

Title:

Name: Date

Title:

Reviewed by:

Name: Date

I. INTRODUCTION

The purpose of this Biological Evaluation (BE) is to review the Proposed Action for the Ute Water Conservation District (Ute Water) enlargement of Hunter Reservoir and Kirkendall Dam on East Leon Creek in the Grand Valley Ranger District of the Grand Mesa, Uncompahgre and Gunnison National Forests (GMUG) (see Figure F-1). This project includes two components: an enlargement of the existing reservoir and relocating of the existing access road, currently passable only by specialized vehicles, to a condition permitting use by heavy construction equipment.

This BE is intended to provide sufficient information to determine if the Proposed Action will affect species listed as sensitive species designated by the Regional Forester in Region 2. This BE was prepared in accordance with the US Department of Agriculture Forest Service Region 2 directives set forth in the Forest Service Manual 2672.4, R2-2600-94-2.

Forest Service Manual (FSM) Supplement 2600-94-2 provides direction on the review of actions and programs authorized, funded or implemented by the Forest Service (FS) relative to the requirement of sensitive species in Region 2. FS policy regarding BEs is stated in FSM 2672.4 as follows: "Biological Evaluation. Review all FS planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, proposed or sensitive species." The BE is the means of conducting the review and documenting the findings.

FS Objectives - Under FSM 2672.41, the objectives for completing BEs for proposed FS programs or activities are 1) to ensure that FS actions do not contribute to loss of viability of any native or desired non-native plant or animal species; 2) to ensure that activities do not cause any species to move toward federal listing; and 3) to incorporate concerns for sensitive species throughout the planning process, reducing negative impacts to species and enhancing opportunities for mitigation.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Proposed Action

The Proposed Action is to enlarge Hunter Reservoir and to rehabilitate the dam to address safety issues.

The dam impounds the existing 16-acre reservoir, which contains Ute Water's existing 110 acre-foot water right at that site (Figure F-1). Ute Water proposes to enlarge the dam to impound an inundated surface area of approximately 80 acres. The enlarged reservoir would contain water storage of 1,340 acre-feet, comprised of the company's existing right of 110 acre-feet (July 28, 1902), a conditional right of about 582 acre-feet (July 24, 1952), and an additional 648 acre-feet would be transferred from a conditional right Ute Water holds at another potential reservoir site on Leon Creek, the Big Park site.

In the process of enlarging the dam, Ute Water would address all of the dam safety issues identified by the Colorado Office of the State Engineer at the dam. These include: erosion on the embankment's downstream slope due to overtopping, erosion of the spillway channel, corrosion

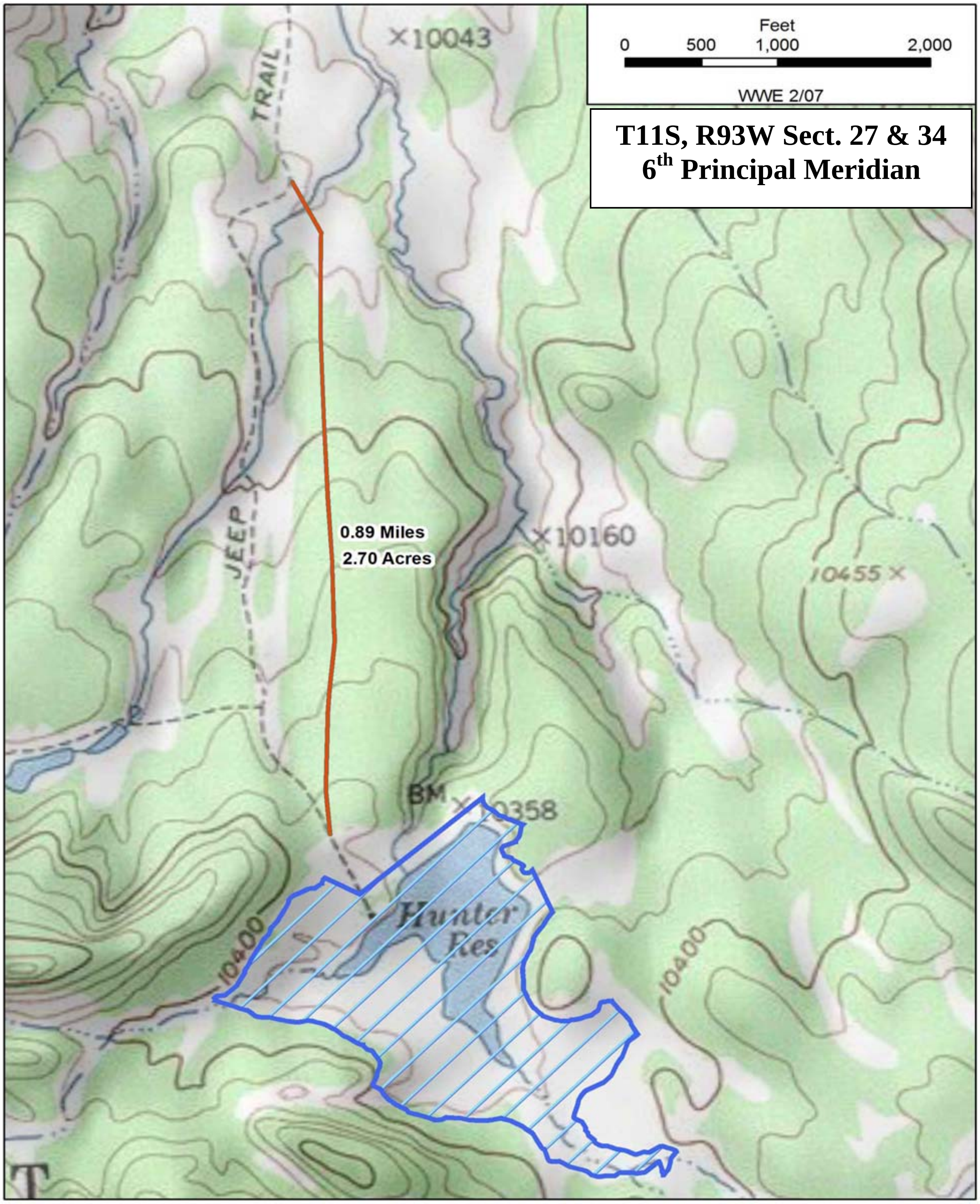


Figure F-1. Hunter Reservoir project

of the outlet conduit, seepage at the toe of the embankment, soft areas associated with the seepage, and deterioration of the upstream, riprapped slope of the embankment.

Design and Construction: The existing dam is a homogeneous, gravelly clay embankment founded on glacial drift soils placed across East Leon Creek. It has a vertical height of 9 feet with a crest elevation at 10,367 feet. Its crest width is 8 feet and its length is 412 feet. The enlarged dam would increase the vertical height by 26 feet to a total of 37 feet with a crest elevation at 10,393 feet. The new crest width would be 18 feet and the crest length would be 1,098 feet. The new dam would also include two saddle dams: the west saddle dam, an embankment located immediately west of the new dam and the east saddle dam, located in a topographic saddle 600-700 feet east of the new dam. The saddle dams would have vertical height less than 20 feet and crest lengths less than 570 feet.

The foundation of the enlarged embankment and the two saddle dams consists of glacial till overlying Uinta formation sandstone and claystone. The embankments would be constructed using material drawn from on-site borrow areas within the area to be inundated. The upstream slope of the dam would be surfaced with a layer of riprap comprised of basalt boulders. The riprap would be taken from a basaltic scree located just south of the reservoir and processed on-site. The new outlet structure includes a 24 inch-diameter pipe which extends approximately 200 feet. Water velocity through the pipe is approximately 12 feet/second, which creates a fish passage barrier (FWS 2007). The new service spillway inlet structure includes a vertical drop greater than 10 feet, to a 30 inch concrete encased, welded steel pipe over 450 feet long. It emerges in Leon Creek at a location known as the “impact basin” where energy is dissipated. This structure will be a fish passage barrier, at all discharges. The service spillway is a fish passage barrier due to the length of the conduit and the vertical drop in the inlet structure.

A blanket cutoff would be located across the valley bottom and upstream of the existing embankment. Constructed of concrete, the cutoff would extend into the bedrock and is intended to mitigate seepage, reduce pressure on the dam itself, and eliminate the soft soil conditions identified on the downstream toe of the embankment.

The new dam would have two spillways, a replacement service spillway and a new emergency spillway. The new service spillway would control normal pool and pass routine floods downstream. Set in the west saddle dam, the spillway would establish normal pool at 10,386.5 feet elevation and would pass excess water down a conduit into an impact basin below the face of the dam. The emergency spillway would be a new feature, located in a topographic saddle about 1,600 feet southeast of the dam, with a concrete control beam at 10,388 feet elevation, 1.5 feet above normal pool. The emergency spillway is set away from the main embankment to discharge floodwater into a drainage basin just east of East Leon Creek, preventing erosion of the dam due to overtopping. The emergency spillway is a fish passage barrier because it only functions during probable maximum flood (PMF) events. Furthermore, there is not discharge to a perennial stream.

The enlarged embankment would have an internal drainage system to reduce pore pressures and to prevent internal erosion of embankment and foundation materials. The principal system element would be toe drains in the embankment and saddle dams to collect and convey seepage flows to the downstream side of the embankments. The toe drains would be 4-in drainpipe surrounded by filter material.

Most materials for the construction would be derived from the borrow areas and the nearby basalt scree described above. However, road surface gravels and filter drain materials (crushed rock) as well as cement would be delivered to the site. Concrete would be mixed and poured on site.

Because of Hunter Reservoir's elevation and snow cover, the season during which construction activities could take place is very short, extending from sometime in June until late September. The short construction season means that dam enlargement and construction of associated features would require two summers for completion. Access to the site is long and slow, taking up to four hours for a round trip. It is likely that an on-site work camp would be set up at the reservoir because of the time-consuming commute and the need to maximize working time at the site.

Some of the area to be inundated has trees. All trees up to 10,393 feet elevation would be cleared prior to construction to reduce debris in the reservoir and the potential for blocking spillways.

Operation and Maintenance: The dam would fill from springs and from annual snowmelt in the 1.5 square miles basin that serves the reservoir. Currently, the reservoir fills to capacity after the irrigation season, by late November. Once the 1,340 acre-feet capacity is reached, the natural flow of East Leon Creek passes through the reservoir and dam including spring runoff. This pattern is expected to continue if the reservoir were enlarged, with the expectation that it would take much longer to fill and would require retention of some of the spring runoff. Releases would be based on need for irrigation and, increasingly over time, for domestic consumption.

The reservoir normal pool would be maintained until releases into the Ute Water system were required. Most likely, those releases would occur late in the summer and in the early fall as downstream reservoirs were filled prior to winter. Throughout the winter, at least 37 acre-feet of water would remain in the reservoir. This is the amount of water in the reservoir's 36-feet deep dead pool, the depth of water in the reservoir that cannot flow out. During some winters, more water may remain in the reservoir. Ute Water personnel would make periodic visits to the reservoir as needed to open or close the outlet gate, monitor stream flow and pool level, clear obstructions in the spillways and monitor dam condition, checking for seepage, rodent burrows and unwanted vegetation. Weeds would be monitored for several years after construction of the dam to ensure that no foreign seeds were transported during construction. A complete description of operation and maintenance activities is described in the Hunter Dam Enlargement Design Plan.

Road Improvements: The 11-mi access route from Vega Reservoir to Hunter Reservoir is made up of two National Forest System Roads (NFSR), NFSR 262, from Vega Reservoir up Leon Creek to East Leon Creek, and NSFR 280, up East Leon Creek to the reservoir. Both roads are currently high clearance, four-wheel drive roads with frequent stream crossings. Much of the roads' length may be impassable during spring run-off. In order to allow passage of the heavy equipment needed to construct the dam and the trucks that would carry crushed rock, cement or concrete and other material to the work site, substantial improvements to the roads would be required at 26 separate points, all of them on the last six miles of the route.

Road improvements would include leveling steep approaches to crossings, improving drainage, removing dips and bumps, enlarging small stream crossings, and relocating portions of the road upslope out of wetland areas. Culverts would be placed at several of the stream crossings. A temporary bridge may be installed at the crossing of Leon Creek. A 200-foot section of road in a bog near the reservoir cannot be moved and will be reconstructed using geotextiles, log corduroy, rock drainage and other techniques appropriate to roads located in wetlands. After construction of the enlarged dam, any structures placed in the roadway would be removed and many of the physical alterations to the roadway would be returned to their original condition, if they were not needed for resource protection. Sections of the road that were relocated out of wetlands would remain in their new upland locations. The remainder of the roadway would be allowed to return to its current condition. Over time, access to the upper reaches of Leon Creek and East Leon Creek would return to their existing state.

B. No Action

Under the No Action alternative, Hunter Reservoir would not be enlarged. This alternative is required by National Environmental Policy Act (NEPA) as a baseline for estimating the environmental effects of the action alternatives.

III. ENVIRONMENTAL BASELINE

The environmental baseline includes a summary of past and present impacts of federal, state, and private actions and other human activities in the analysis area.

A. Water Development

Domestic and agricultural water developments have been extensive across the Grand Mesa National Forest. Construction of reservoirs, ditches, and domestic water sources has resulted in regulation of most free-flowing waters and naturally impounded waters on the Grand Mesa. Current water policies do not support strategies to protect and maintain flows. Surface water diversions for agriculture and municipal use are expected to continue and increase. Within the project area, the Proposed Action is the only new water project under consideration.

B. Livestock Grazing

Livestock grazing has been a common practice on the lands of western Colorado for many decades. Historic over-grazing has been reported as a factor in the decline or loss of riparian areas, as well as modifying some forest understory habitats, particularly aspen forests. Changes in grazing management were initiated as part of allotment management plan revisions in the 1980s. These revisions have aided in the reduction of grazing impacts to wetlands and riparian areas and resulted in greater stability for these habitats. Effective management of livestock grazing in the project area will help minimize impacts to riparian areas and subsequently reduce potential impacts to the associated wildlife and fish species.

C. Fire Management

Prescribed fire activities have been concentrated in the shrubland and oakbrush communities on south-facing slopes of the Battlement Mesa, north of Collbran, Colorado, outside of the project area. The objective of reestablishing fire intervals in these plant communities is to reduce natural fuel buildup and improve browse for big game species. There have been no historic prescribed burns in the project area. The frequency of wildfires on GMUG may increase as vegetation communities continue to develop and fuels consequently increase. The potential impacts of wildfires may be severe to sensitive species, affecting individuals directly and indirectly by destroying occupied habitats. Current fire suppression is expected to continue with a priority to protect privately owned lands. There are no plans to use prescribed fire in the project area within the next five years.

D. Timber Management

Past timber harvests of Engelmann spruce, subalpine fir, and aspen have occurred across GMUG. Historic timber management practices have had varying impacts to sensitive species, ranging from directly removing suitable habitats to providing regenerated habitat types. It has been proposed that removal of spruce/fir timber required by the Proposed Action be treated as a conventional timber sale.

E. Recreation

Historic recreational opportunities within the project area include fishing, hunting, and firewood gathering. Light dispersed camping occurs during the summer months with heavy dispersed camping occurring during the fall big game hunting seasons. Winter uses include cross-country skiing, snowshoeing, and snowmobiling. Dispersed recreational activities are believed to seldom result in direct loss of species habitat but may adversely affect individuals.

Summer and winter recreational use levels are high and are expected to increase as the number of users increases. There are currently no winter recreational special use permits that promote compaction of snow layers within the Flat Tops Lynx Analysis Unit (LAU). NFSR 280 and 262, which provide access to Hunter Reservoir, are primitive four-wheel drive roads which are part of an extensive network of winter snowmobile trails. As such, they are designated snow compaction routes for the purposes of lynx habitat management.

IV. SPECIES CONSIDERED AND EVALUATED

A. Forest Service Sensitive Species

The FS provided a list of Region 2 sensitive species that may occur within the GMUG. From this list, a sub-list of species that may occur on the Grand Mesa was identified by the Grand Valley Ranger District wildlife biologist and the FS botanist. Sensitive species on this list were then evaluated for their potential to occur in the analysis area. Table F-1 lists each of the species on this sub-list, gives a brief description of their habitats, and makes a determination of their potential to occur within the analysis area. Habitat descriptions and distribution information are from several sources. For mammals, it is Armstrong (1972) and Fitzgerald et al. 1994; for birds it is Andrews and Righter (1992) and Kingery (1998); for amphibians, Hammerson (1999); for fishes, Colorado Division of Wildlife (CDOW) fisheries biologists familiar with the area; and for plants, Spackman et al. (1997, 2002) and Weber (2001). Other authorities are cited in the narrative for each species.

Table F-1. Grand Valley Ranger District Sensitive Species (Potential)

Species Common Name	Species Scientific Name	Status	Habitat Description	Habitat Affected?
MAMMALS				
Fringed myotis	*Myotis thysanodes*	Sensitive Species	Inhabits caves, mines, and buildings in low elevation conifer and oakbrush shrublands up to 7,500 feet. Forages over associated riparian habitat	No
American Marten	*Martes americana*	MIS & Sensitive Species	Inhabits mature spruce/fir and mixed conifer forests	Yes
Pygmy shrew	*Sorex hoyi*	Sensitive Species	Moist boreal environments, forest generalist, all captures of this species in Colorado have occurred above 9,600 feet	Yes
River otter	*Lontra canadensis*	Sensitive Species	Riparian habitats that traverse a variety of other habitats, mainly large river systems	No
Spotted bat	*Euderma maculatum*	Sensitive Species	Restricted to cliff or rock faces in arid canyons associated with waterways in ponderosa pine or Douglas fir at 6,000-8,000 feet	No
Townsend's big-eared bat	*Corynorhinus townsendii*	Sensitive Species	Forages in semi-desert shrublands, pinyon-juniper woodlands and open montane forests. Roosts in caves, mines, buildings and crevices	No
Wolverine	*Gulo gulo*	Sensitive Species	Inhabits undisturbed high boreal forests and tundra near timberline	Yes
BIRDS				
Three-toed woodpecker	*Picoides dorsalis*	Sensitive Species	Species is resident in mature and old growth stands of spruce/fir	Yes
American peregrine falcon	*Falco peregrinus anatum*	Sensitive Species	Species nests on high cliffs overlooking rivers/lakes and forages over forests and shrublands	No
Black swift	*Cypseloides niger*	Sensitive Species	Species nests on high cliffs near or behind large waterfalls and forages high above the landscape over conifer forests	No
Boreal owl	*Aegolius funereus*	Sensitive Species	Mature spruce/fir or spruce/fir-lodgepole forests	Yes

Table F-1. Grand Valley Ranger District Sensitive Species (Potential)

Species Common Name	Species Scientific Name	Status	Habitat Description	Habitat Affected?
Brewer's sparrow	*Spizella breweri*	Sensitive Species	Inhabits sagebrush-dominated shrublands; may also be found in alpine willow stands	No
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Sensitive Species	Inhabits sagebrush dominated shrublands, intermixed with grasslands and mountain shrublands	No
Flammulated owl	*Otus flammeolus*	Sensitive Species	Nests in cavities in aspen and aspen mixed with conifer habitat to 10,000 feet, foraging close to nest sites, may forage over shrublands	No
Gunnison Sage-grouse	*Centrocercus minimus*	Candidate Species	Late-successional sagebrush	No
Lewis' woodpecker	*Melanerpes lewis*	Sensitive Species	Inhabits lowland and foothill riparian areas and nests in decadent cottonwoods 2,000-8,000 feet	No
Loggerhead shrike	*Lanius ludovicianus*	Sensitive Species	Species inhabits open country with available lookout perches, especially semi-desert shrublands	No
Northern goshawk	*Accipiter gentilis*	MIS & Sensitive Species	Mixed hardwoods and conifers in stands of mature timber above 7,500 feet	Yes
Northern harrier	*Circus cyaneus*	Sensitive Species	Nests and forages in dense portions of open montane grasslands and wet meadows	Yes
Olive-sided flycatcher	*Contopus cooperi*	Sensitive Species	This species breeds primarily in mature spruce/fir or Douglas fir forests	Yes
Purple martin	*Progne subis*	Sensitive Species	Species forages in open grassy parks, shores of lakes, meadows and around ponds; prefers aspen habitat near open water or wet meadows. Nests in mature aspen stands	No
Sage sparrow	*Amphispiza belli*	Sensitive Species	Desert sagebrush habitat	No
Western yellow-billed cuckoo	*Coccyzus americanus*	Candidate Species	Lowland riparian forest, thickets, and urban woodlands	No
AMPHIBIANS				
Boreal toad	*Bufo boreas boreas*	Sensitive Species	Subalpine forest habitats with marshes, wet meadows, streams, beaver ponds, and lakes	Yes

Table F-1. Grand Valley Ranger District Sensitive Species (Potential)

Species Common Name	Species Scientific Name	Status	Habitat Description	Habitat Affected?
Northern leopard frog	*Rana pipiens*	Sensitive Species	Wet meadows, marshes, beaver ponds, and streams	Yes
FISHES				
Bluehead sucker	*Catostomus discobolus*	Sensitive Species	Colorado River Basin Drainage: Variety of habitat, headwater streams to large rivers	No
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	MIS & Sensitive Species	Headwater streams and lakes	Yes
Flannelmouth sucker	*Catostomus latipinnis*	Sensitive Species	Deep slow flowing pools in large rivers	No
Roundtail chub	*Gila robusta*	Sensitive Species	Colorado River Basin Drainage: Variety of habitat, usually in slow-flowing water adjacent to fast moving water	No
INSECTS				
Great Basin silverspot	*Speyeria nokomis nokomis*	Sensitive Species	Inhabits wetlands fed by springs or seeps; host plant violet at 5,200-9,000 feet	No
PLANTS				
Lesser panicled sedge	*Carex diandra*	Sensitive Species	Fens, calcareous meadows 6,100-8,600 feet.	No
Lesser bladderwort	*Utricularia minor*	Sensitive Species	Aquatic plant found in floating fens to 10,000 feet	No
Slender cottongrass	*Eriophorum gracile*	Sensitive Species	Fens, 8,000-1,200 feet	Yes
Rocky Mountain thistle	*Cirsium perplexans*	Sensitive Species	Found on barren gray shale slopes 4,500-7,000 feet. Rock, cliff, and canyon habitat	No
Harrington's beardtongue	*Penstemon harringtonii*	Sensitive Species	Found 6,800-9,200 feet in open sagebrush or, less commonly, pinyon-juniper habitat. Not documented in Mesa or Delta County	No
DeBeque phacelia	*Phacelia scopulina var submutica*	Sensitive Species	Found at low elevation 4,700-6,200 feet, on steep clay slopes in the Wasatch Formation.	No
Sun-loving meadowrue	*Thalictrum heliophilum*	Sensitive Species	Sagebrush and pinyon-juniper habitat in underdeveloped soils, light colored clays with shale fragments; 6,300-8,800 feet	No

Table F-1. Grand Valley Ranger District Sensitive Species (Potential)

Species Common Name	Species Scientific Name	Status	Habitat Description	Habitat Affected?
Wetherill milkvetch	*Astragalus wetherillii*	Sensitive Species	Big sagebrush and pinyon-juniper habitat. Steep slopes, canyon benches, and talus below cliffs. On sandy clay soils derived from shale and sandstone 5,250-7,400 feet	No

Based on this evaluation, it was determined that a number of these species are not expected to occur because the project area because is either outside of their range and/or does not contain any potential habitat for them (Table F-2). This group of species will not be impacted by the proposed projects and a determination of "No impact" is appropriate. These species have been eliminated from detailed evaluation and are not discussed further in this BE.

Table F-2. Affected Vegetation

Vegetation Type	Hunter Reservoir	Existing Access Road	New Access Road
	Acres		
Spruce/fir	17.5	0.3	2.7
Willow/riparian	11.8	1.2	<0.1
Grass/forb/shrub	55.0	0.1	<0.1

The remaining sensitive species may occur in the project area based on known occurrences of, or the presence of suitable habitats for, these species. Detailed evaluations of the potential impacts of the proposed project on these species are discussed in the following sections.

V. SPECIES INFORMATION

A. Slender Cottongrass

Existing Environment

Slender cottongrass, despite the name, is a sedge of the family Cyperaceae. It is found in bogs and swamps in the mountains of north central, south central, and southwest Colorado at 8,000 to 12,000 feet (Harrington 1964). This species has recently been documented in fens on Grand Mesa; extensive searches of the Hunter Reservoir area by several knowledgeable individuals, including a Forest Service botanist, did not turn up any individuals of this species, although it is present in some of the fens on Grand Mesa proposed as mitigation for the wetlands lost as a result of construction at Hunter.

Effects of the Proposed Action

Inundation of the 2-acre fen on the south side of the existing reservoir will remove all potential habitat for this species and most likely preclude its ever becoming established there.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal**

listing or a loss of species viability rangewide" for slender cottongrass. This determination is based upon the absence of this species from Hunter, and the presence of suitable unoccupied habitat elsewhere on Grand Mesa.

B. Lesser Bladderwort

Existing Environment

This member of the Lentibulariaceae (bladderwort) family is found in high elevation wetlands and fens on the Grand Mesa National Forest. The plant is a perennial forb found in shallow water and wet soil. It has small bladders that are used to trap aquatic invertebrates which are digested for nutritional purposes. The bladderworts are the only predatory aquatic plants in the United States. The flowers are pale yellow and resemble a snapdragon, with 2-8 flowers on a thread-like stalk rising 1.5" to 6" above the water's surface. The distribution of lesser bladderwort is circumboreal, south in North America to New Jersey, Indiana, North Dakota, California and Colorado. There are several documented occurrences of lesser bladderwort on the Grand Mesa, but no records in the project area. Since the preferred habitat is floating fens (Austin 2006), it is unlikely this species will be found near any project feature.

Effects of the Proposed Action

As there is no suitable habitat near any of the proposed reservoir sites, there should be no effect on this species.

Determination

Implementation of the Proposed Action would have **"no impact"** on the lesser bladderwort due to absence of suitable habitat.

C. American Marten

Existing Environment

American marten are indicators of interior forest integrity in that they reflect the vigor of the microhabitats on which they depend. They are sensitive to changes in the type and level of human activities, modification of microhabitats, and availability of prey (FS 2001). Habitat conditions are the primary influence on current local populations of marten. Since legal trapping for marten in many states has been discontinued, research indicates marten population trends are now directly influenced by changes in habitat components (prey abundance, availability of denning sites, cover patterns) at the microhabitat scale and changes in habitat composition and connectivity (mature forest stand fragmentation) at the landscape scale (Campbell 1979).

Mature conifer forests provide specific marten habitat requirements including resting sites, denning sites, subnivean access areas, logs in various stages of decomposition, and trees leaning into other trees. The extent of marten occurrence, on both a local and range-wide scale, is closely correlated with the occurrence of suitable mature coniferous forests that provide these special habitat requirements. Marten also frequent high elevation riparian areas associated with coniferous forests.

The marten's diet varies by season, year, and geographic area. A typical summer diet may consist of bird eggs and nestlings, insects, fish, and small mammals. This strictly carnivorous diet shifts in autumn months to take advantage of berries and other fruits. During winter months, small- and medium-sized mammals, including voles, mice, hares, and squirrels, become important prey items. Martens hunt for small mammals by searching on the ground or snow surface. Down woody debris is an important component of the marten's habitat because small cavities and passages are created when this natural debris is covered with snow and are used as shelter by small mammal prey species. Martens use these subnivean spaces to hunt prey.

In the central and southern Rocky Mountains, including the GMUG, marten prefer mature to over-mature spruce/fir and lodgepole pine cover types. This cover type provides canopy closure and diversity in forest-floor structure that are preferred by the marten. As summarized by Buskirk et al. (1994), unique microhabitat conditions are selected for resting sites, natal and maternal dens, and access sites to spaces beneath the snow. Resting sites were generally associated with larger tree boles and with logs of intermediate decomposition. In a study by Wilbert (1992), natal dens were reported to be associated with large tree boles. Coarse woody debris and the lower branches of live trees were reported by Corn and Raphael (1992) to be important for allowing marten to gain access to subnivean spaces.

Microhabitat features that are important to the marten include accumulations of woody structures on or near the forest-floor and leaning trees used as ramps into closed, interconnected tree canopies. Standing, broken-topped dead trees, hollow stumps, and decomposing logs provide access to subnivean habitats (FS 2001). Other microhabitat features that function in similar ways are living branches near the ground (Buskirk et al. 1989) and associated aspen and/or riparian vegetation (Spencer and Zielinski 1983).

There is extensive spruce/fir forest in the project area, and such habitat is found near Hunter Reservoir and along the proposed access road. Marten have been documented to occur in the project area. The estimated home range for a marten is two square miles (1,280 acres) (FS 2001). No individuals or their sign were noted during field work.

Effects of the Proposed Action

Direct effects, such as injury or mortality, to the marten from implementation of the Proposed Action will not be likely due to their ability to leave disturbance areas. Some individuals of the various marten prey species may be directly affected if they are unable to leave the treatment areas. Suitable habitats for the marten and its prey species will be disturbed; most of this habitat will be permanently lost. Most will be replaced with open water, and that along the access road will not regenerate because the road will remain open for off-road vehicle use. Approximately 20 acres of spruce/fir will be removed by construction of the enlarged Hunter Reservoir and the access road.

Indirect impacts to marten would occur during implementation of the project. Increased human activity and associated visual and audible disturbances may temporarily displace individuals from project features during construction activities. Following completion of activities, the type and degree of human disturbance is expected to return to current levels.

Project activities will indirectly affect habitats used by prey species; however, prey species are not thought to be a limiting factor for marten on the Grand Mesa (FS 2005). This effect is not expected to be a substantial impact to the marten because of the assumed relative abundance of prey species in the project area and the relative amount of adjacent suitable habitats that will not be affected by the Proposed Action.

Effects of the No Action Alternative could result in a slight increase in spruce/fir forest and a decrease in human activity as the reservoir will no longer be a destination for fishing.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the American marten. This determination is based on the potential for impacts to marten or their prey, permanent loss of approximately 20 acres of habitat, some degradation of suitable remaining marten and prey habitats, the maintenance of connectivity with undisturbed habitats, and the availability of suitable undisturbed habitats.

D. Pygmy Shrew

Existing Environment

The pygmy shrew may occur in suitable habitats throughout the mountainous regions of central Colorado. All captures of this species in the state have been at elevations above 9,600 feet. There are no reported occurrences of this species in Mesa or Delta counties, Colorado (Fitzgerald et al. 1994). This species can occur in a variety of habitats including subalpine forests of spruce/fir and lodgepole pine, clear-cut and selectively logged forests, forest-meadow edges, boggy meadows, willow thickets, aspen/fir forests, and subalpine parklands. As with many shrews, behavior patterns are poorly understood. It builds runways under stumps, fallen logs, and litter. This species is active day or night and eats a variety of animal matter including carrion, invertebrates, and other small mammals.

Suitable habitats for this species occur within the Forest and the project area. Although unconfirmed, pygmy shrews are expected to occur in these suitable habitats throughout the Forest and project area.

Effects of the Proposed Action

Under the Proposed Action, implementation of the project will disturb approximately 20 acres of shrew habitat. The Proposed Action will remove or disturb much of the shrew habitats within the action area by removing some of the down woody debris and conversion of terrestrial habitats to aquatic. Direct injury or mortality may occur to this species due to the operation of equipment in occupied habitats.

The degree of functionality of post-project shrew habitats is difficult to quantify, but will depend on existing shrew habitat conditions, intensity and distribution of activities within the reservoir site, and potential shrew responses to these impacts. The functional loss of shrew habitats within the reservoir site will not result in substantial effects to the pygmy shrew because of the generalist habitat requirements of this species, and the availability of similar shrew habitats outside the disturbed areas.

The effects of the No Action Alternative would result in a slight increase in suitable shrew habitat.

Determination

Implementation of the Proposed Action **“may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide”** for the pygmy shrew. This determination is based on the potential for injury or mortality of individual shrews, disturbance to potentially occupied habitat, permanent loss of approximately 20 acres of habitat, the availability of suitable habitats outside of the treatment units, and the lack of occurrence records in Mesa/Delta counties.

E. Wolverine

Existing Environment

Across their range, wolverines inhabit boreal forests and tundra habitats. In the Rocky Mountains of Idaho, wolverines spend as much as 70 percent of their time within coniferous vegetative cover (Copeland 1996). Specific habitat associations in Colorado are not known but are suspected to be similar to other populations inhabiting mountain habitats in the lower 48 states. In addition to coniferous cover, large resident ungulate populations are also identified as an important wolverine habitat component (Fitzgerald et al. 1994). Wolverine occurrence information in Colorado is mostly limited to records established in the nineteenth century. Information from these records and the paucity of more recent sightings indicates wolverine populations in the state were never high and that this species, if it still occurs in Colorado, occurs at very low densities.

Suitable coniferous and alpine habitats for the wolverine exist within the Forest and analysis area. Despite recent efforts by CDOW, no definitive wolverine evidence was identified within the state (Fitzgerald et al. 1994). No evidence of historic wolverine presence has been documented in the project area.

Effects of the Proposed Action

Implementation of the Proposed Project will affect potentially suitable wolverine habitats. The spruce/fir cover type, which is suitable wolverine habitat, accounts for approximately 20 acres in Hunter Reservoir and along the access road. This habitat will be permanently lost.

Effects of the No Action Alternative could result in a slight increase in the amount of spruce/fir.

Determination

Implementation of the Proposed Action will have “**no impact**” to wolverine based on the extremely low likelihood of occurrence of this species in the project area.

F. Three-Toed Woodpecker

Existing Environment

In Colorado, burned areas and subalpine coniferous forests, particularly spruce/fir habitats, are the preferred habitats of the three-toed woodpecker. Burned areas and old-growth forests provide suitable conditions for wood-boring insects, the primary food source for the three-toed woodpecker. In Colorado, three-toed woodpeckers have been observed in suitable habitats between 7,000 and 12,000 feet in elevation. In Colorado, nesting typically occurs from late May to late July (Versaw 1998).

Three-toed woodpecker habitats exist within the project area. Two nests were located during summer 2006 field work. One was along the existing access road about one half mile north of Hunter Reservoir. The other was just east of the existing reservoir a short distance above the proposed high water line. Both nests were in dead spruce trees. Approximately 20 acres of spruce/fir forest will be removed by enlargement of Hunter and relocation of the access road.

Effects of the Proposed Action

Implementation of the Proposed Project will affect potentially suitable woodpecker habitats. The spruce/fir cover type, which is suitable habitat, accounts for approximately 20 acres in Hunter Reservoir and along the access road. This habitat will be permanently lost.

Effects of the No Action Alternative could result in a slight increase in the amount of spruce/fir as the existing reservoir is replaced by dry land.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the three-toed woodpecker. This determination is based on the potential for direct injury or mortality and the availability of suitable habitats outside the reservoir site.

G. Boreal Owl

Existing Environment

In Colorado, boreal owls occur primarily in mature Engelmann spruce and subalpine fir forests above 9,000 feet in elevation. This owl prefers wet habitats near streams or bogs, because these areas typically support large populations of small mammals, the primary prey item for the boreal owl. Summer adult ranges can vary between 593 and 869 acres, while winter ranges may vary between 1,961 and 3,631 acres (Ryder 1998).

Boreal owl habitats are primarily mature to over-mature spruce/fir; such habitat exists within the Forest and project area. At Hunter Reservoir and along the access road, approximately 20 acres of nesting habitat, plus 68 acres of foraging habitat (willow/riparian and grass/forb/shrub vegetative types) will be impacted. Boreal owls have been documented to occur and breed on the Grand Mesa. Many instances of documented nesting are based on use of artificial nest boxes. Recorded calls were played around Hunter Reservoir and the proposed access road on the night of 2 July 2006, but no response was noted.

Effects of the Proposed Action

Under the Proposed Action, pre-construction nest surveys will be conducted in order to identify nest trees and eliminate potential disturbance of nest trees due to implementation of the Proposed Action. Identification of active nest locations before construction will also eliminate potential impacts to nesting owls because no activities will be allowed within one quarter mile of an active nest from March 1 to July 31. Construction may proceed after it has been confirmed that young have left the nest.

Approximately 20 acres of nesting and 68 acres of foraging habitat will be eliminated by construction of Hunter Reservoir and the access road.

Determination
The implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the boreal owl. This determination is based on the presence of abundant nesting and foraging habitats in the project area and the mitigation measures intended to prevent destruction of occupied nests. Pre-construction surveys will be conducted as stated in the Design Criteria (Section 2.5 of the DEIS). No boreal owls have been observed during previous surveys. If any boreal owls or habitat are found to be present, Ute Water will coordinate with the FS to determine the most effective means of mitigating or precluding impacts.

H. Flammulated Owl

Existing Environment
The flammulated owl inhabits old growth or mature ponderosa pine forests but will also inhabit ponderosa pine/Douglas fir or other conifer forests mixed with mature aspen. In some areas, birds are seen in pure aspen; some also occur in old-growth pinon/juniper woodlands (Andrews and Righter 1992). They prefer forests with dense canopy covers close to relatively open areas. They are an uncommon to common summer resident in foothills and lower mountains and appear to be more common than most observers have realized. They appear to be most common in western and southern Colorado. The flammulated owl apparently migrates through the mountains. They are most commonly found between 4,500-7,800 feet, but will range up to 10,000 feet. They nest in old flicker holes or other woodpecker holes with eggs laid from early May to late June. They are found throughout the Grand Mesa National Forest in suitable habitat. No aspen habitat will be affected in the area of the Proposed Action. Nonetheless, recorded calls were played on the night of 2 July 2006. No response was noted.

Effects of Proposed Action
Since there is little or no suitable nesting habitat present, there will be no impact from the Proposed Action. Hunter Reservoir lies above the maximum known elevational breeding range for this species.

Determination
Implementation of the Proposed Action will have "**no impact**" on the flammulated owl. This determination is based on the lack of effects to suitable habitats within the reservoir site, the availability of suitable habitats outside of the reservoir site.

I. Northern Goshawk

Existing Environment
The northern goshawk is widespread in its distribution. It breeds in coniferous, deciduous, and mixed forests throughout much of North America. In Colorado, the goshawk is considered a rare to uncommon year-round resident of coniferous forests (FS 2001). Goshawks often re-use the same territory year after year and sometimes use the same nest. Preferred nesting sites and prey

base are typically found in mature forests (Barrett 1998). Post-fledging areas surround the nest site and range in size from 300-600 acres (Reynolds et al. 1992). Foraging areas may extend beyond breeding and nesting territories to include as much as 5,000-6000 acres of various cover types (FS 2001 and 2005). Typical breeding habitat includes mature forests with high canopy closure, high density of large trees and snags, large downed woody debris, and small (less than two acres) openings in the forest canopy (FS 2001). Nesting typically begins in March and fledging occurs in early to mid-July. Adults and fledglings may occupy nesting areas until late September (FS 2001). As a top-level forest predator, the goshawk typically preys upon rabbits, squirrels, chipmunks, grouse, woodpeckers, jays, robins, grosbeaks, and other forest interior birds and mammals.

Northern goshawk habitat occurs throughout the Forest and project area, with dense spruce/fir forest surrounding Hunter Reservoir. No individuals were observed during field work even though recorded alarm calls were played throughout the summer 2006 field season.

Effects of the Proposed Action

Construction of Hunter Reservoir and the access road will remove approximately 20 acres of nesting habitat in the forum of spruce/fir forest. Before construction begins, recorded goshawk alarm calls will be played in suitable habitat to locate nesting birds. If any nests are found, protections will be implemented similar to those proposed for the boreal owls described above.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the northern goshawk. This determination is based on the availability of suitable nesting and foraging habitats outside of the reservoir site and the measures (nest site surveys) that will prevent impacts to nesting goshawks.

J. Northern Harrier

Existing Environment

The main habitats of the northern harrier include native and non-native grasslands, agricultural lands, marshes, and sagebrush shrublands; during fall migration it may range up to alpine tundra (Andrews and Righter 1992). Habitat for this species at Hunter and along the proposed access road is foraging only, since it is not known to nest above 9,000 feet (Andrews and Righter 1992). No individuals were observed during field work.

Effects of the Proposed Action

Hunter Reservoir enlargement will affect approximately 68 acres of potential foraging habitat.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the northern harrier. This determination is base upon the lack of suitable nesting habitat at Hunter and the abundance of fall migration foraging habitat in the Leon Creek drainage and the Forest

K. Olive-Sided Flycatcher

Existing Environment

The olive-sided flycatcher breeds in boreal forests from Alaska to Newfoundland and in the mountains of the western United States (Jones 1998). In Colorado, the olive-sided flycatcher is a montane summer resident at elevations of 7,000 to 11,000 feet (Andrews and Righter 1992). Olive-sided flycatcher breeding habitat in the western United States is primarily mature spruce/fir, Douglas-fir and, less often, other coniferous forests, and montane and foothill riparian and aspen forests in the 7,000 to 11,000 feet elevational range (Andrews and Righter 1992). Within these habitats, this species occurs primarily within live, logged, or burned forests with snags, natural clearings, bogs, stream and lakeshores with water-killed trees (Jones 1998). Tall trees, trees with spiked tops, or high conspicuous dead branches and dead snags, as well as adequate live trees for nesting sites, are important components of all nesting habitats.

Suitable habitats for this species occur throughout the Forest and within the project area. This species is known to occur within the Forest and the project area, although no individuals were observed during field work.

Effects of the Proposed Action

Under the Proposed Action, injury or mortality to the olive-sided flycatcher may occur due to the operation of equipment in occupied habitats. Effects on suitable habitats will include the removal or alteration of potentially suitable nest trees and insect host trees. The Proposed Action will result in the permanent removal of approximately 20 acres of nesting habitat (spruce/fir forest).

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the olive-sided flycatcher. This determination is based on the potential for direct injury or mortality of individual birds, alteration of existing nesting and foraging habitat, maintenance of suitable nesting and foraging habitats within the project area following the project implementation.

L. Northern Leopard Frog

Existing Environment

The northern leopard frog occurs throughout Colorado, excluding most of the southeastern and east-central portions of the state. The elevation range of this species is from approximately 3,500 feet to above 11,000 feet. Suitable habitats for this species include wet meadows and the banks and shallows of marshes, ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches. Most often leopard frogs can be seen near the water's edge, but they may roam when wet meadows and marshes are present. Once abundant in suitable habitats in Colorado, this species has recently become scarce. Although causes for the decline of this species in Colorado may be numerous, several important causes include increased predation pressure from bullfrogs, disturbance or destruction of breeding ponds, and natural extirpations which commonly occur in small, localized populations (Hammerson 1999).

Suitable habitats for leopard frog include water bodies, wetlands and streams. These habitats are present at Hunter Reservoir, as well as stream crossings on the Hunter access road. By far the greatest area of suitable habitat is adjacent to the reservoir in the extensive wetlands surrounding the existing reservoir. No individuals, either adults or larvae, were observed during field work.

Effects of the Proposed Action

Injury or mortality to the leopard frog will be possible during the implementation of the Proposed Action due to project-related increase of vehicle traffic near suitable habitats. Suitable habitats will be disturbed by roadwork and dam construction. Potential habitat will be permanently lost by inundation following dam construction.

Determination

Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the northern leopard frog. This determination is based on the potential for injury or mortality to individuals and elimination of suitable habitats. Also, the amount of potential habitat removed is slight compared to the total available in the project area.

M. Boreal (Mountain) Toad

Existing Environment

In 1995, the FWS listed the boreal toad (*Bufo boreas boreas*) as a Candidate for federal protection under the Endangered Species Act (ESA) (FWS 1995*b*). On September 29, 2005, the FWS announced the withdrawal of the Southern Rocky Mountain population of the boreal toad (*Bufo boreas boreas*) from the list of species being considered for protection under the ESA, which made it no longer a Candidate species (FWS 2005*b*). However, the boreal toad is also a FS Region 2 sensitive species and does receive the protection afforded to species with this designation.

The boreal toad is restricted to the southern portions of the Rocky Mountains. It typically occurs in mountain habitats between 8,500 and 11,500 feet in elevation occupying damp conditions near marshes, wet meadows, streams, beaver ponds, and lakes interspersed in subalpine spruce/fir, lodgepole, and aspen forests. In late spring and early summer, toads typically occur in or near aquatic habitats and gradually become more terrestrial as the season progresses.

Once common in the Colorado Rocky Mountains, this species experienced a severe decline in distribution and population numbers that was first reported in the early 1990s. Possible factors associated with the decline include damaging effects from increased ultraviolet light on embryos, acidification and heavy-metal contamination of water, and habitat destruction and degradation. Specifically in Colorado, habitat destruction and degradation may be important factors for recent declines. Many suitable habitats have been lost or damaged following mountain reservoir construction and operation. Algal blooms apparently caused by the release of nutrients from mountain home septic tanks have degraded lakes once occupied by boreal toads (Hammerson 1999). A fungal disease may also be a factor. The nearest extant breeding population is found on Buzzard Creek, 12 miles northeast of the project area.

Suitable habitat is found at Hunter Reservoir as well as at stream crossings on the access road. No individuals, either adults or larvae, were found during field work.

Effects of the Proposed Action
Injury or mortality to the boreal toad will be possible during the implementation of the Proposed Action, due to project-related increase of vehicle traffic near suitable habitats. Suitable habitats for the boreal toad may be disturbed by roadwork and dam construction. Potential habitat will be permanently lost by inundation following dam construction.

Determination
Implementation of the Proposed Action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the boreal toad. This determination is based on the potential for injury or mortality to individuals and elimination of suitable habitats. Also, the amount of potential habitat removed is slight compared to the total available in the project area.

N. Colorado River Cutthroat Trout

Existing Environment
The Colorado River cutthroat (CRCT) historically occupied portions of the Colorado River watershed in Wyoming, Colorado, Utah, Arizona, and New Mexico. Its original distribution included the upper portions of large streams and rivers such as the Green, Yampa, White, Colorado, and San Juan Rivers. Lower portions of these rivers were uninhabited by this species due to summer thermal barriers. Currently, populations are restricted to headwater streams and lakes. Populations typically occupy streams with average daily flows of less than 30 cubic feet per second (cfs), gradients of greater than four percent, and at elevations greater than 7,500 feet (CRCT Task Force 2001).

Introduction of non-indigenous salmonids is considered one of the greatest negative impacts on CRCT. Many other factors including over-grazing, mining, logging and obstructions to migration from water diversions resulted in widespread reduction in distribution throughout historic CRCT range. CRCT is classified "species of special concern" by the CDOW. Species of special concern is a non-statutory classification defined by CDOW administrative rules. This classification does not carry the same protection of law as statutorily defined threatened or endangered status under state and Federal Endangered Species Acts, but it does denote the need for caution with regard to decisions affecting current or historic habitat.

CRCT have exhibited diverse life history requirements and populations can occupy three different aquatic ecosystem complexes. All three complexes can be found in the Leon Creek watershed and for this reason a general discussion of CRCT life cycles is needed.

Fluvial populations complete the entire life cycle in streams like Leon Creek, while adfluvial populations migrate between stream and lake habitats at different times during the annual life cycle. An adfluvial population may be possible in Hunter Reservoir and the brief stream feeding it. Lacustrine populations complete their life cycle entirely within a lake environment and are dependent on shallow, rocky shoreline habitat (Young 1995). A wealth of information is available on fluvial and adfluvial populations, but not much is known about CRCT lacustrine populations, although populations are reported in Rocky Mountain National Park and Wyoming (Young 1995).

Currently, most known populations throughout CRCT range are restricted to headwater streams and lakes. One well known adfluvial population in Colorado is Trapper's Lake on the White River National Forest. This highly introgressed population, planted with Yellowstone cutthroat, *O. c. bouveri*, from 1943-1950 was historically the primary broodstock source for CRCT stocking throughout western Colorado (Young 1995).

Typically, the fluvial populations are found in streams with average daily flows of less than 30 cfs, gradients of greater than four percent, and at elevations greater than 7,500 feet (CRCT Task Force 2001), e.g., Leon Creek. This does not represent preferred habitat as much as it represents habitat where CRCT out-compete non-indigenous salmonids such as brook char, *Salvelinus fontinalis*.

Conservation and core populations are defined by the CRCT Task Force. Conservation populations are a reproducing and recruiting population that is ≤10% introgressed with non-indigenous salmonid genes. A core population is >99% pure (CRCT Task Force 2001). Of 227 listed conservation populations of CRCT throughout their primary tri-state range of Utah, Wyoming and Colorado, 125 fluvial populations occupy approximately 320 miles of streams and lacustrine or adfluvial populations are found in 28 lakes covering 672 surface acres in Colorado (CRCT Task Force 2001).

Thirty-two conservation populations are known to occur in 22 watersheds on the GMUG. Two other populations occur on Bureau of Land Management land adjacent to GMUG. These populations occupy approximately 96 miles of stream, with most GMUG populations occurring in tributaries of the North Fork of the Gunnison River. Streams on the GMUG support 27% of the known CRCT conservation populations in the Colorado, Dolores and Gunnison Geographic Management Units (GMUs). Existing populations are located in isolated headwater streams of generally 2-4 miles in length, and remain at risk for localized extirpations. Two CRCT conservation populations have been established in lakes totaling approximately 75 surface acres on the Grand Mesa; however, severe drought and dam reconstruction have likely affected the abundance of these populations. Conservation populations of CRCT are important because they represent potential genetically pure sources for re-introduction to other streams or lakes and because they extend the range of pure populations.

The miles of stream occupied by CRCT on GMUG have increased 29% since 2001 due to DNA analysis of existing CRCT populations. The analysis indicated ≤10% introgression in these existing populations which qualifies them as conservation populations. It is important to note documented range extension was not from increases in abundance or dispersal of individual populations but simply from having done the analysis. Suitable habitats for CRCT and other trout species occur in many lakes and streams in the project area. Many additional conservation populations may be present but simply have not been identified because they have not been tested. Other populations of CRCT, albeit of unknown genetic purity, occur in lakes and streams within the project area.

CDOW stocking records for Hunter Reservoir are shown in Table F-3 and include four years of non-indigenous salmonids, greenback cutthroat, and likely introgressed CRCT progeny from Trapper's Lake.

Table F-3. CDOW Stocking Record for Hunter Reservoir, 1979-2004

Date Stocked	Species*	Number of Fish	Average Length, mm
9-01-1979	PPN	2000	12
7-01-1981	PPN	1600	80
8-01-1983	PPN	1600	75
8-01-1985	PPN	1600	29
7-20-1987	CRN	1600	100
8-08-1991	CRN	3300	24
9-07-1993	CRN	3247	35
8-15-2001	***CR1***	3308	25
8-24-2004	***CR1***	3299	37

*CDOW Management abbreviations:
PPN (Pikes Peak Native) is *O. c. stomias* broodstock maintained by DOW in City of Colorado Springs water supply on Pikes Peak, El Paso County
CRN (Colorado River Native) cutthroat introgressed with other non-indigenous cutthroat) is mixed or unknown genetic purity *O. clarkii* spp., historically from Trapper's Lake, Rio Blanco County
CR1 (Colorado River No. 1) is genetically pure *O. c. pleuriticus* from broodstock maintained by CDOW

CRCT were found in Hunter Reservoir and most streams in the upper Leon Creek drainage during field work. Distribution of this species and other salmonids, according to the CDOW, are shown in Table F-4.

Table F-4. Summary of Hunter Reservoir Vicinity Trout Species Distribution

Stream or Segment	Fish Species Present			
	Cutthroat	Cuttbow	Rainbow	Brook
East Leon	X			
Middle Leon	X			
West Leon	X			
Upper Leon	X			
Middle Leon		X		
Lower Leon			X	
Monument	X			
Kenney	X			
Park				X
Plateau above Vega Res.	X		X	X
Plateau below Vega Res.			X	
Hunter Reservoir	X			
Monument Reservoir #1	X			

These populations are not considered conservation populations as defined in the CRCT conservation agreement (2001). CRCT from these waters have not been analyzed for levels of introgression according to Dan Kowolski, Area Fish Biologist for CDOW (2005).

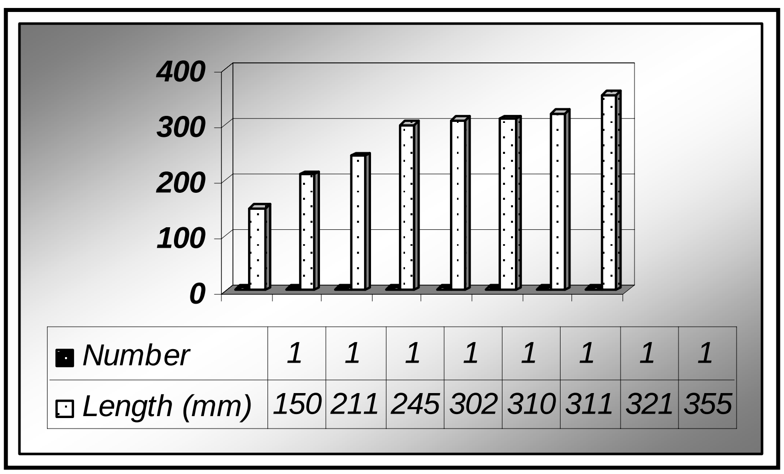
Effects of the Proposed Action

The Proposed Action may have a direct negative effect to the fluvial CRCT population located in Leon Creek by reducing flows in the creek roughly 50% of the time. These impacts may be partially offset by CRCT ability to successfully spawn in habitat in stream segments unsuitable for adults (Young 1995). Also, the rate of gain for groundwater recharge of average low flows downstream from the dam is quite high. Current available spawning habitat should remain available. Reservoir discharges in water years with no spill may provide rearing and adult habitat in years when these habitats may not otherwise be available.

The fill period will be longer after the reservoir is expanded. When the enlarged reservoir is filling, the downstream reaches of Leon Creek could experience a slightly decreased flow during the months when the gate is closed (the fill period). In particular, the 0.6 mile stream reach immediately below Hunter Reservoir before the confluence with the first significant tributary is likely to experience decreased instream flow by the Proposed Action. Flows may be limited to snowmelt and groundwater discharge. Following snowmelt, groundwater discharges below the dam have been estimated at 0.2 cfs to 1.1 cfs, increasing with distance below the dam.

Hunter Reservoir CRCT populations may be positively impacted by a notable increase in depth and water volume in the conservation pool. Size of CRCT captured in 2005 indicates good, rapid growth of fish stocked at 25 mm in 2001 and 37 mm in 2004 (Table F-5).

Table F-5. Length distribution of Hunter cutthroat in 2005 stocked in 2001 and 2004



Indirect effects are expected to be minimal and discountable and are not expected to produce measurable changes in spawning or rearing habitat, or affect water quality for CRCT.

Determination

Indirect effects of the proposed alternative are anticipated to be minimal and discountable and would not result in a measurable change in downstream spawning habitat. Spawning habitat, the limiting habitat factor, and water quality are not expected to change.

During construction, the existing population within Hunter Reservoir could be adversely impacted. If downstream flows are reduced or water quality degraded by construction, downstream populations could also be adversely impacted. Therefore, the proposed action **"may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor to cause a trend towards federal listing or a loss of species viability rangewide"** for the Colorado River cutthroat trout. However, post-construction impacts are likely to be positive due to creation of a larger body of water which should support a larger population than the current reservoir. The larger reservoir should also improve downstream habitat by moderating stream flow fluctuations.

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Department of Agriculture
Forest Service
Grand Mesa, Uncompahgre and Gunnison National Forests

HUNTER RESERVOIR ENLARGEMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Appendix G
Biological Assessment

Hunter Reservoir Enlargement

Biological Assessment

Grand Mesa, Uncompahgre and Gunnison National Forest

Prepared by:

Name: Date

Title:

Name: Date

Title:

Reviewed by:

Name: Date

I. INTRODUCTION

The purpose of this Biological Assessment (BA) is to review the Proposed Action for the Ute Water Conservation District (Ute Water) enlargement of Hunter Reservoir and Kirkendall Dam on East Leon Creek in the Grand Valley Ranger District of the Grand Mesa, Uncompahgre and Gunnison National Forests (GMUG). This project includes two components: an enlargement of the existing reservoir and a relocating of the existing access road, currently passable only by specialized vehicles, from wetlands to a less environmentally sensitive upland location. The relocated road will permit use by heavy construction equipment. Following construction, the road will be returned to a primitive state.

This BA is intended to provide sufficient information to determine if the Selected Management Action will affect species listed as Threatened, Endangered, Proposed, or by the Fish and Wildlife Service (FWS). This BA was prepared in accordance with the U.S. Department of Agriculture Forest Service Region 2 directives set forth in the Forest Service Manual 2672.4, R2-2600-94-2.

Forest Service Manual 2670 provides direction on the review, actions, and programs authorized, funded or implemented by the Forest Service (FS) relative to the requirements of the Endangered Species Act (ESA).

II. CONSULTATION HISTORY

In 1998, the US Bureau of Land Management (BLM) prepared the Plateau Creek Pipeline Replacement Project Environmental Impact Statement (EIS) to address the impacts of constructing a new pipeline to bring water from Ute Water's terminal reservoirs, Jerry Creek Reservoirs Nos. 1 and 2, to the treatment plant in Palisade (BLM 1998). In particular, the Programmatic Biological Opinion developed by the FWS for the pipeline EIS provides the mitigation for impacts on the endangered fish of the Colorado River from activities in the Ute Water system, not exclusively for the Plateau Creek pipeline project, but for all anticipated future activities for Ute Water.

III. SELECTED MANAGEMENT ACTION

The Selected Management Action is to enlarge Hunter Reservoir and to rehabilitate the dam to address safety issues.

The dam impounds the existing 16-acre reservoir, which contains Ute Water's existing 110 acre-feet water right at that site. Ute Water proposes to enlarge the dam to impound an inundated surface area of approximately 80 acres. The enlarged reservoir would contain water storage of 1,340 acre-feet, comprised of the company's existing right of 110 acre-feet (July 28, 1902), a conditional right of about 582 acre-feet (July 24, 1952), and an additional 648 acre-feet would be transferred from a conditional right Ute Water holds at another potential reservoir site on Leon Creek, the Big Park site. The reservoir has a 37 acre-feet conservation pool.

In the process of enlarging the dam, Ute Water would address all of the dam safety issues identified by the Colorado Office of the State Engineer at the dam. These include: erosion on the embankment's downstream slope due to overtopping, erosion of the spillway channel, corrosion of the outlet conduit, seepage at the toe of the embankment, soft areas associated with the seepage, and deterioration of the upstream, riprapped slope of the embankment.

Design and Construction: The existing dam is a homogeneous, gravelly clay embankment founded on glacial drift soils placed across East Leon Creek. It has a vertical height of 9 feet with a crest elevation at 10,367 feet. Its crest width is 8 feet and its length is 412 feet. The enlarged dam would increase the vertical height by 26 feet to a total of 37 feet with a crest elevation at 10,393 feet. The new crest width would be 18 feet and the crest length would be 1,098 feet. The new dam would also include two saddle dams: the west saddle dam, an embankment located immediately west of the new dam and the east saddle dam, located in a topographic saddle 600-700 feet east of the new dam. The saddle dams would have vertical height less than 20 feet and crest lengths less than 570 feet.

The foundation of the enlarged embankment and the two saddle dams consists of glacial till overlying Uinta formation sandstone and claystone. The embankments would be constructed using material drawn from on-site borrow areas within the area to be inundated. The upstream slope of the dam would be surfaced with a layer of riprap comprised of basalt boulders. The riprap would be taken from a basaltic scree located just south of the reservoir and processed on-site. A new outlet works would include replacement of the existing 18-inch outlet conduit with a 24-inch conduit.

A blanket cutoff would be located across the valley bottom and upstream of the existing embankment. Constructed of concrete, the cutoff would extend into the bedrock and is intended to mitigate seepage, reduce pressure on the dam itself, and eliminate the soft soil conditions identified on the downstream toe of the embankment.

The new dam would have two spillways, a replacement service spillway and a new emergency spillway. The new service spillway would control normal pool and pass routine floods downstream. Set in the west saddle dam, the spillway would establish normal pool at 10,386.5 feet elevation and would pass excess water down a conduit into an impact basin below the face of the dam. The emergency spillway would be a new feature, located in a topographic saddle about 1,600 feet southeast of the dam, with a concrete control beam at 10,388 feet elevation, 1.5 feet above normal pool. The emergency spillway is set away from the main embankment to discharge floodwater into a drainage basin just east of East Leon Creek, preventing erosion of the dam due to overtopping.

The enlarged embankment would have an internal drainage system to reduce pore pressures and to prevent internal erosion of embankment and foundation materials. The principal system element would be toe drains in the embankment and saddle dams to collect and convey seepage flows to the downstream side of the embankments. The toe drains would be 4-inches drainpipe surrounded by filter material.

Most materials for the construction would be derived from the borrow areas and the nearby basalt scree described above. However, road surface gravels and filter drain materials (crushed rock) as well as cement would be delivered to the site. Concrete would be mixed and poured on site.

Because of Hunter Reservoir's elevation and snow cover, the season during which construction activities could take place is very short, extending from sometime in June until late September. The short construction season means that dam enlargement and construction of associated features would require two summers for completion. Access to the site is long and slow, taking up to four hours for a round trip. It is likely that an on-site work camp would be set up at the reservoir because of the time-consuming commute and the need to maximize working time at the site.

Some of the area to be inundated is forested with Engelmann spruce and sub-alpine fir. All trees up to 10,393 feet elevation would be cleared prior to construction to reduce debris in the reservoir and the potential for blocking spillways.

Operation and Maintenance: The dam would fill from springs and from annual snowmelt in the 1.5 square mile basin that serves the reservoir. Currently, the reservoir fills to capacity after the irrigation season, by late November. Once the 1,340 acre-feet capacity is reached, the natural flow of East Leon Creek passes through the reservoir and dam including spring runoff. This pattern is expected to continue if the reservoir were enlarged, with the expectation that it would take much longer to fill and would require retention of some of the spring runoff. Releases would be based on need for irrigation and, increasingly over time, for domestic consumption.

The reservoir normal pool would be maintained until releases into the Ute Water system were required. Most likely, those releases would occur late in the summer and in the early fall as downstream reservoirs were filled prior to winter. Throughout the winter, at least 37 acre-feet of water would remain in the reservoir. This is the amount of water in the reservoir's 36-feet deep dead pool, the depth of water in the reservoir that cannot flow out. During some winters, more water may remain in the reservoir. Ute Water personnel would make periodic visits to the reservoir as needed to open or close the outlet gate, monitor stream flow and pool level, clear obstructions in the spillways and monitor dam condition, checking for seepage, rodent burrows and unwanted vegetation. Weeds would be monitored for several years after construction of the dam to ensure that no foreign seeds were transported during construction. A complete description of operation and maintenance activities is described in the Hunter Dam Enlargement Design Plan.

Road Improvements: The 11-mile access route from Vega Reservoir to Hunter Reservoir is made up of two National Forest System Roads (NFSR), NFSR 262, from Vega Reservoir up Leon Creek to East Leon Creek, and NFSR 280, up East Leon Creek to the reservoir. Both roads are currently high clearance, four-wheel drive roads with frequent stream crossings. Much of the roads' length may be impassable during spring run-off. In order to allow passage of the heavy equipment needed to construct the dam and the trucks that would carry crushed rock, cement or concrete and other material to the work site, substantial improvements to the roads would be required at 26 separate points, all of them on the last six miles of the route.

Road improvements would include leveling steep approaches to crossings, improving drainage, removing dips and bumps, enlarging small stream crossings, and relocating portions of the road upslope out of wetland areas. Culverts would be placed at several of the stream crossings. A temporary bridge may be installed at the crossing of Leon Creek. A 200-feet section of road in a wetland near the reservoir cannot be moved and will be reconstructed using geotextiles, log corduroy, rock drainage and other techniques appropriate to roads located in wetlands. After construction of the enlarged dam, any structures placed in the roadway would be removed and many of the physical alterations to the roadway would be allowed to return to their original condition if they were not needed for resource protection. Sections of the road that were relocated out of wetlands would remain in their new upland locations. The remainder of the roadway would be allowed to return to its current condition. Over time, access to the upper reaches of Leon Creek and East Leon Creek would return to their present state.

IV. DESCRIPTION OF THE ACTION AREA

Hunter Reservoir is located 11 miles south of Vega Reservoir in the Grand Valley Ranger District of the GMUG. The reservoir is at the headwaters of East Leon Creek at an elevation of approximately 10,300 feet (Figure G-1).

Dominant vegetation is Engelmann spruce and subalpine fir. Wetlands surround the present reservoir and associated streams; these wetlands are of the grass/forb/shrub and willow/riparian vegetative types. One of these wetlands is considered a fen (peatland) and covers an area of just under two acres.

At present, Hunter gets limited recreational use from fishermen in the summer and big game hunters in the fall. A well-used winter snowmobile trail passes near the present high-water line, but it is doubtful that many people engage in ice fishing at the reservoir. There are two informal campsites at the reservoir, but the primitive condition of the access road tends to keep human activity relatively low.

V. SPECIES CONSIDERED AND SPECIES EVALUATED

The following list includes Threatened, Endangered, Proposed, or Candidate species that could potentially be found on the Grand Valley Ranger District of GMUG, or adjacent to or downstream from the project area (Table G-1). A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance was needed to complete the BA. Sources of information included FS records and files, Colorado Division of Wildlife (CDOW), FWS, and published research cited in the appropriate sections.

No further analysis is needed for species that are not known or suspected to occur in the project area, and for which no suitable habitat is present. Vegetation maps were obtained from the FS, and project features were digitally overlayed on these maps to determine if suitable habitat for listed species occurs in the vicinity of the Selected Management Action.

The boreal toad (*Bufo boreas boreas*) has recently been dropped as a Candidate species by FWS. It and the DeBeque phacelia (*Phacelia scopulina submutica)* are evaluated in the Biological Evaluation (BE) for FS sensitive species for this project and will not be discussed further here. No portion of the project area has been designated as critical habitat by the Secretary of the Interior (PL-93-205, Section 4, 1978).

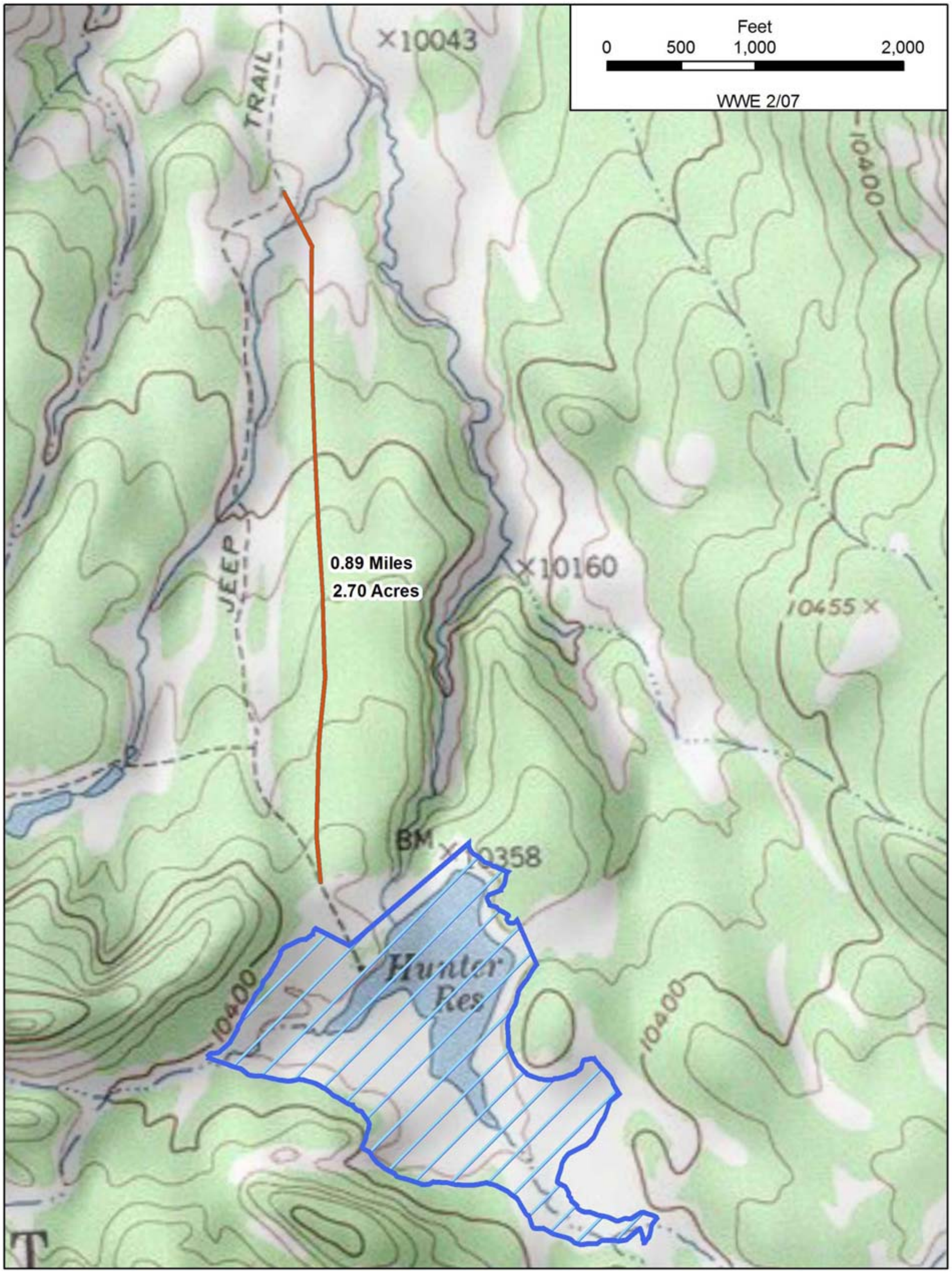

Figure G-1. Location of Hunter Reservoir and Access Road

Table G-1. Federal Endangered and Threatened Species for the Grand Valley Ranger District, GMUG (Potential)

Common Name	Scientific Name	*Status	Known/suspected to be present?	Suitable habitat present?	Habitat
Uintah Basin hookless cactus	*Sclerocactus glaucus*	T	No	No	Shrublands, open piyon/juniper woodldands, 4,500 to 6,000 feet
DeBeque phacelia	*Phacelia scopulina submutica*	C	No	No	Slopes of Green River Formation
Uncompahgre fritillary	*Boloria improba acrocnema*	E	No	No	Alpine willow thickets
Razorback	*Xyrauchen texanus*	E	No	No	Large streams and rivers at lower elevations
Colorado pikeminnow	*Ptychocheilus lucius*	E	No	No	Large streams and rivers at lower elevations
Humpback chub	*Gila cypha*	E	No	No	Large streams and rivers at lower elevations
Bonytail	*Gila elegans*	E	No	No	Large streams and rivers at lower elevations
Bald eagle	*Haliaeetus leucocephalus*	T	Yes	Yes	Shores of large lakes, rivers at low- to mid-elevations
Mexican spotted owl	*Strix occidentalis lucida*	T	No	No	Low elevation canyons, old-growth Douglas-fir, mixed conifer or pine/oak at middle elevations
Yellow-billed cuckoo	*Coccyzus americanus*	C	No	No	Lower elevation riparian woodlands
Black-footed ferret	*Mustela nigripes*	E	No	No	Prairie dog colonies
Canada lynx	*Lynx canadensis*	T	Yes	Yes	High elevation coniferous forest

* E = Endangered, T = Threatened, C = Candidate

Suitable habitat is present only for Canada lynx and bald eagle, so potential effects are evaluated in the appropriate section of this report. Analysis was not carried forward for any other species; the listed fishes have been consulted upon in the past.

The four listed fish species are not present in the project area, but changes in quantity or quality of water flows into the Colorado River may affect these species. In 1998, the BLM prepared the Plateau Creek Pipeline Replacement Project EIS to address the impacts of constructing a new pipeline to bring water from Ute Water's terminal reservoirs, Jerry Creek Reservoirs Nos. 1 and 2, to the treatment plant in Palisade. Much of the information developed for and used in that EIS applies to the Selected Management Action. In particular, the Programmatic Biological Opinion

(BO) developed by the FWS for the pipeline EIS provides the mitigation for impacts on the endangered fish of the Colorado River from activities in the Ute Water system.

VI. EVALUATED SPECIES SURVEY INFORMATION

Information on bald eagle status, distribution, and ecology was obtained from the Northern States Bald Eagle Recovery Plan (FWS 1983), the CDOW, and researchers (Andrews and Righter 1992, Kingery 1998).

Information on Canada lynx status, distribution, and ecology was derived from a Forest-wide Geographic Information System (GIS) lynx mapping coverage developed in collaboration with FWS, and information found in the Canada Lynx Conservation Assessment and Strategy (LCAS) Ruediger et al. 2000) and the lynx science report (Ruggiero et al. 2000). There is reliable data available on the population status of lynx in the Leon Creek drainage. Some of the year 2000 transplanted lynx from southwestern Colorado have been located multiple times in the general project area (Shenk 2001). Figure G-2 shows locations of radio-collared lynx as of 2005.

VII. ENVIRONMENTAL BASELINE FOR THE SPECIES EVALUATED

A. Colorado River Fishes

Habitat for the Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus)* does not occur in Leon Creek or any of its tributaries. However, habitat is present for these species in the Colorado River, which is over 30 miles downstream of Hunter Reservoir. Consequently, project effects to these fish species would be limited to potential water depletions as described in Section VIII below.

B. **Bald Eagle** (*Haliaeetus leucocephalus*); Federally-Threatened.

Information on species status and ecology for the bald eagle is contained within the Northern States Bald Eagle Recovery Plan (FWS 1983). No bald eagle nest or roost trees have been documented on the Grand Valley Ranger District of the GMUG (Kingery 1998). Bald eagle primarily use low elevation habitat along the Colorado, Eagle, and White River drainages and may use some stream systems that project up onto the Grand Mesa National Forest (Andrews and Righter 1992). Individuals may occasionally be seen in fall and winter on Grand Mesa. Winter use by bald eagle on the Forest is limited at higher elevations by lack of prey and habitat trends are likely stable. No habitats that would be affected by the Selected Management Action offer potential nesting or wintering habitat for bald eagles.

Hunter Reservoir does provide possible foraging habitat for migrating bald eagles, so this species is addressed in this report.

C. **Canada Lynx** (*Lynx canadensis*); Federally-Threatened.

Canada lynx are secretive forest-dwelling cats that historically were found throughout much of Canada, the forests of northern tier states, and subalpine forests of the Central and Southern Rocky Mountains. Colorado is thought to be the southernmost distribution of the lynx (Fitzgerald et al. 1994). On March 23, 2000, FWS listed the contiguous United States Distinct

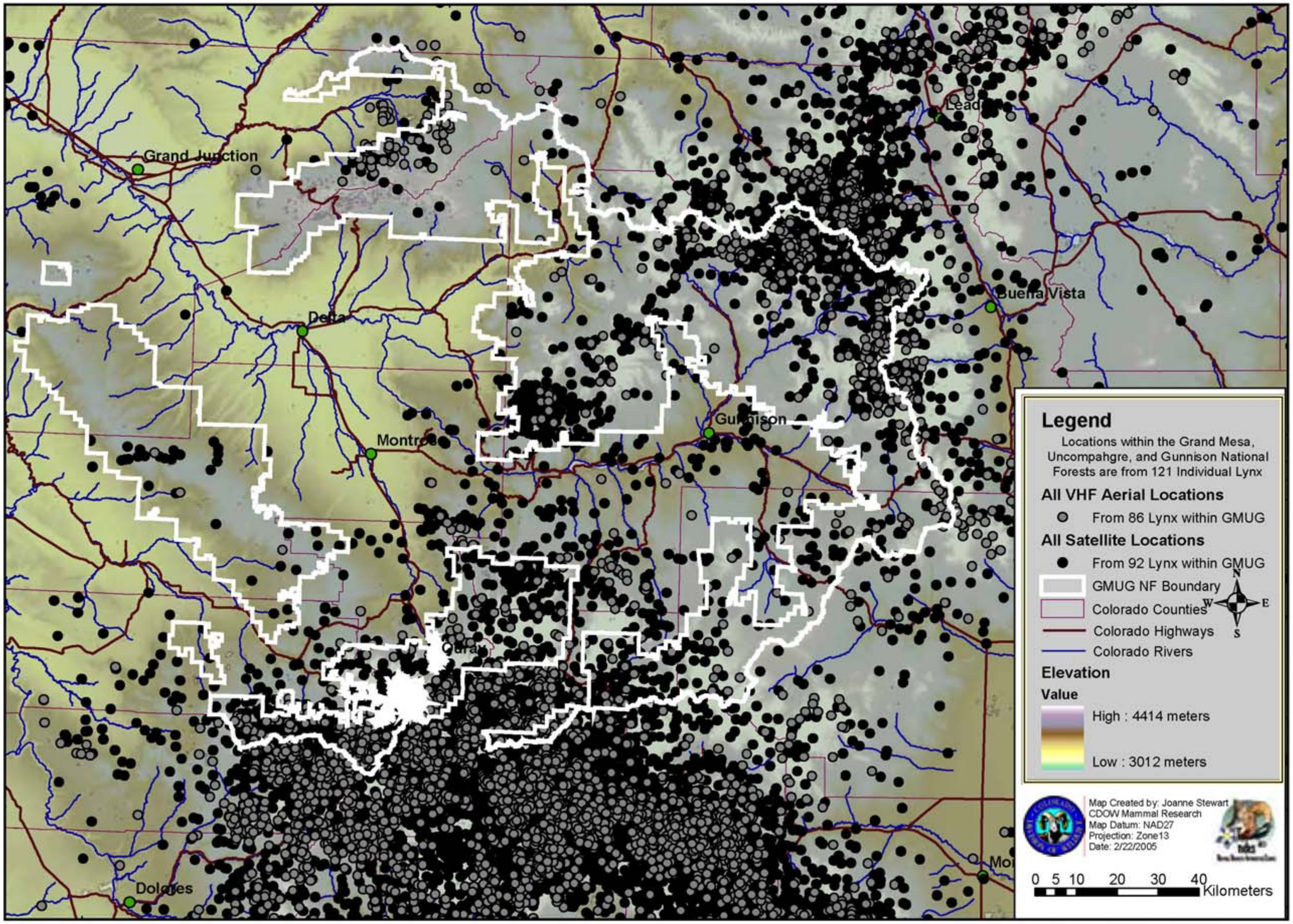

Figure G-2. Locations of radio-collared lynx as of 2005

Population of the Canada lynx as a threatened species under the ESA. No critical habitat has been designated for the lynx. Canada lynx also are listed as endangered by the State of Colorado.

Lynx habitat generally is described as climax boreal forest with a dense understory of thickets and windfalls (DeStefano 1987). In the Southern Rockies, primary lynx habitat is found in the subalpine and upper montane forests between 2439 and 3658m (8,000 and 12,000 feet) (Ruediger et al. 2000). Subalpine forest habitat is dominated by subalpine fir and Engelmann spruce while the upper montane forest supports lodgepole pine and aspen. Lower elevation montane forests of ponderosa pine, Douglas-fir, and riparian corridors provide connective habitat that may facilitate dispersal and movement between primary habitats and provide additional foraging opportunities (Ruediger et al. 2000). Lynx habitat in Colorado is naturally fragmented by elevation, dry south and west exposures, alpine tundra, open valleys and shrubland (McKelvey et al. 2000). In addition, private land development, urban growth, recreational development, and roads also affect landscape connectivity and access to primary lynx habitat.

Foraging Habitat: Foraging habitat in the Southern Rocky Mountains includes all of the primary lynx habitat vegetation types, as well as other habitats where snowshoe hare – lynx principal prey – are abundant. Snowshoe hares prefer mixed stands of conifer for cover with openings of shrubby hardwoods for feeding (Quinn and Parker 1987). Dense regenerative forest stands are thought to produce the highest densities of snowshoe hares (Koehler 1990), but other studies have indicated that hares also prefer higher elevation in mature to late successional spruce/fir forests. Grouse and small mammal species also are taken, but snowshoe hares are typically the lynx's main prey item, particularly in the winter. In the southern boreal forest and Colorado, red squirrels are an important alternative prey species (Aubry et al. 2000).

Denning Habitat: Lynx denning habitat is found typically in late-successional spruce/fir forests or mature lodgepole pine 0.4 to 2.0 ha (1 to 5 acres) in size interspersed with other cover types (Ruediger et al. 2000). An important component of denning habitat is the presence of a substantial amount of large diameter woody debris on the forest floor (Aubry et al. 2000). Wind felled trees, large root masses, thick shrubs, or evergreen cover compose the understory structure necessary to provide security and thermal cover for lynx kittens (Koehler 1990, Aubry et al. 2000). Suitable denning sites must be located adjacent to quality foraging habitats to be functional (Ruediger et al. 2000). Minimal human disturbance is an important feature of denning sites (Brittell et al. 1989).

Travel Corridors: The average home range for male lynx in southern boreal forests is 150 square km (58 square miles) and 73 square km (28 square miles) for females (Aubrey et al. 2000). The large home ranges in the southern boreal forests are probably in response to the low density of snowshoe hare populations and the fragmenting of habitat (Squires and Laurion 2000). Travel corridors are thought to be an important factor in lynx habitat because of their large home ranges (Brittell et al. 1989). The mosaic of natural and artificial barriers to lynx movement in Colorado indicate the need to maintain undisturbed corridors to link primary lynx habitat. Landscape connectivity for lynx movement may include forested mountain ridges, wooded riparian drainages, and lower elevation forests and shrub habitat. Travel corridors are usually forested and include contiguous vegetation cover over 2 m (6 feet) in height (Brittell et al. 1989). Lynx travel along the edges of meadows, but generally do not cross openings wider than 90 m

(300 feet) (Koehler 1990). However, there are records of lynx using large open expanses of mountain grasslands (Thompson and Halfpenny 1991).

Distribution: Records of lynx occurrence are available from throughout most of the southern Rocky Mountains. During the 1973 -74 winter, a pair of lynx was illegally trapped within Vail Ski Area boundaries (Thompson and Halfpenny 1991). The project area is within the historic range of this species, but there are no historical records for naturally occurring lynx populations in Mesa County (Armstrong 1972). There are, however, recent instances of radio-collared animals reintroduced into the San Juan Mountains by CDOW being documented using areas on Grand Mesa near the project area (Figure G-2).

Risk factors: A number of risk factors affecting lynx productivity in the southern Rocky Mountains have been identified (Ruediger et al. 2000). The exclusion of fires has contributed to the creation of homogenous mature forest stands that do not have the understory development necessary for snowshoe hares. Grazing, along with an increase in elk populations, may have reduced the forage available for snowshoe hares. Winter recreational activities that compact snow, such as snowmobiling and skiing, may reduce the competitive advantage that lynx have in deep snow and allow exploitative competition from coyotes or other species that compete for food. Habitat fragmentation from development, roads, urban growth, and recreational development can contribute to the loss of habitat, a decrease in the connectivity of habitat, and the creation of barriers affecting movement.

Lynx habitat in project area: The project lies within GMUG LAU 5, The Flat Tops (Figure H-3). Lynx habitat is denning and foraging at Hunter Reservoir (Figure H-4). The current access road lies within lynx foraging habitat; the proposed relocation will place the road into lynx denning habitat. The existing access road to Hunter is also a winter snowmobile trail. As a snowmobile trail, it is a designated snow compaction route.

VIII. EFFECTS OF THE SELECTED MANAGEMENT ACTION ON SPECIES EVALUATED

A. Colorado River Fishes, Direct and Indirect Effects

The FWS has previously determined, in BO JG-6-CO-96-F-010, Colorado pikeminnow, *Ptychocheilus lucius,* humpback chub, *Gila cypha,* bonytail, *Gila elegans,* and razorback sucker, *Xyrauchen texanus*, and their critical habitat continued existence may be jeopardized by the proposed Ute Water actions (FWS 1998). The FWS has stated in their biological opinion on Plateau Creek Pipeline Replacement Project that the action “is likely to jeopardize the continued existence of the Colorado Squawfsh, Humpback Chub, Bonytail, and Razorback Sucker and result in the destruction or adverse modification of their critical habitat” However, FWS also developed a reasonable and prudent alternative to avoid a jeopardy opinion, and provided a method for calculating future depletions related to the Ute Water Conservancy District system. All new depletions in the Ute Water system, such as the Hunter Reservoir project, are included. This method requires comparison of the annual finished water provided by Ute Water over a 10 year period with Table 3 of the BO to determine “make up flows” or depletions. Following this method the Ute Water system depletion from 1996 through 2005 totals 1119.5 acre-feet

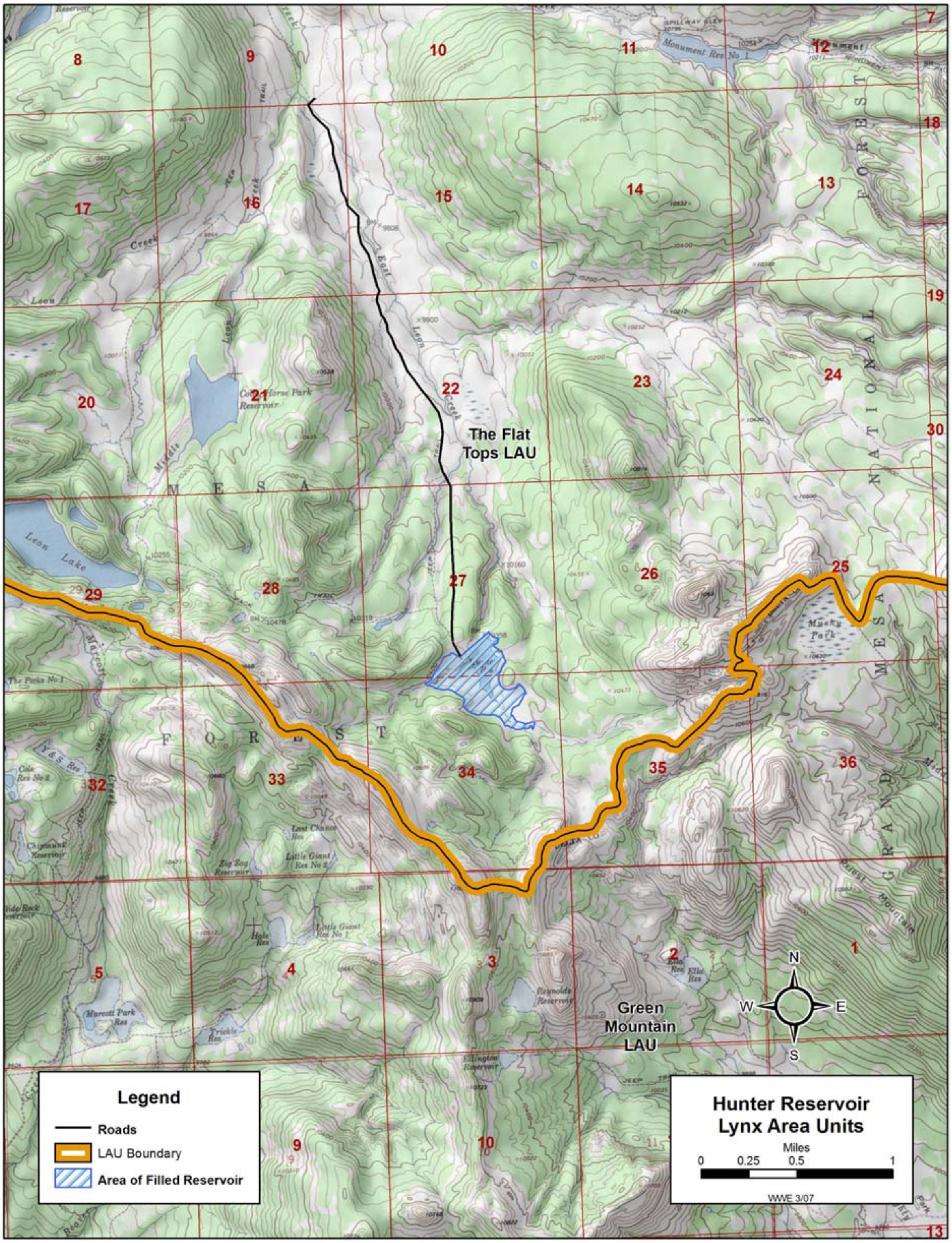

Figure H-3 Lynx Area Units

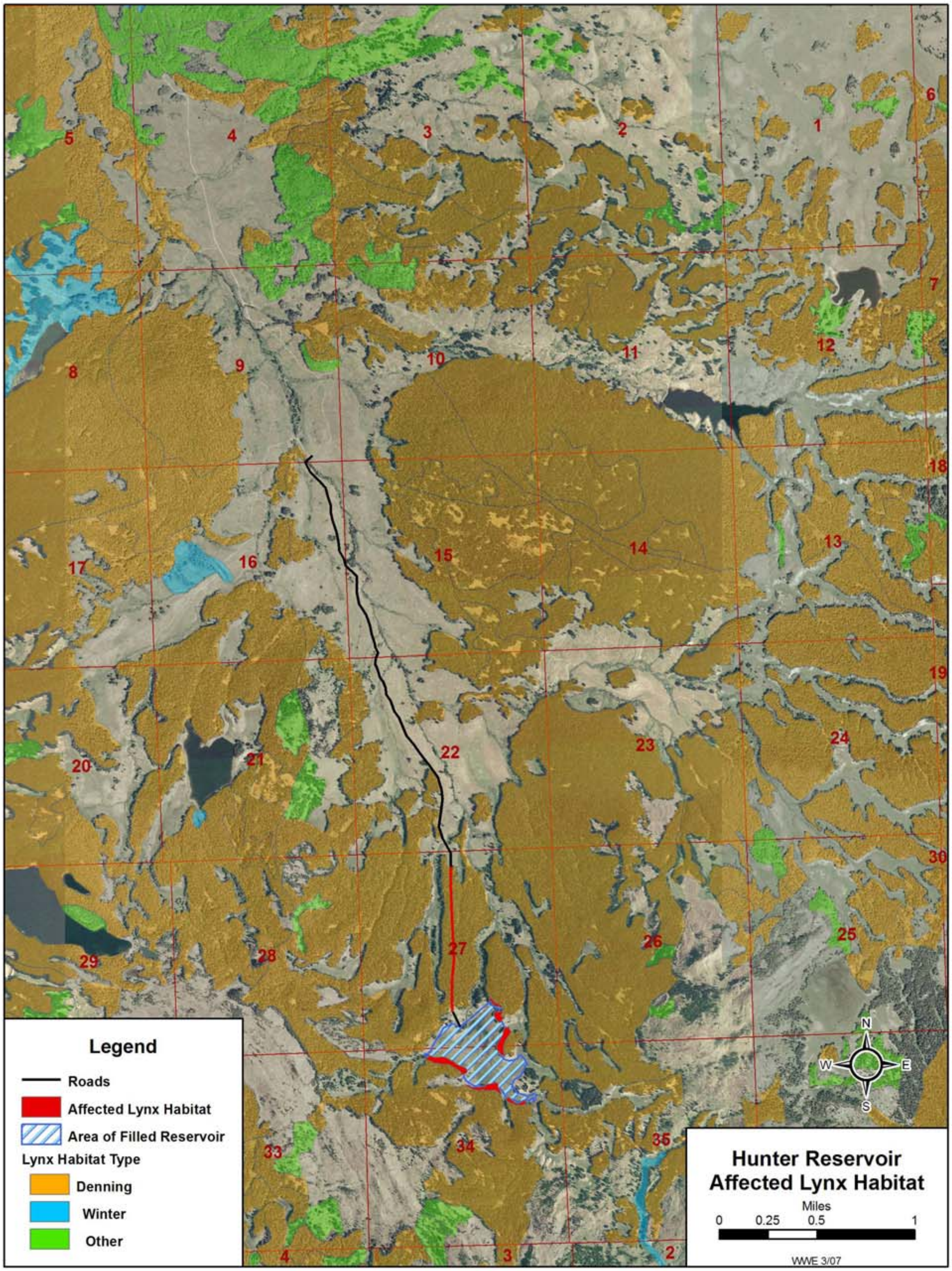

Figure H-4. Lynx habitat

(see Table G-2). Ute Water has paid depletion fees for up to 3,195 acre feet of new depletion as described in the BO. Ute Water is well within the allowable new depletion under the 1998 BO, including the Hunter Reservoir Project.

Table G-2. Water depletion Calculation (Finished Water Produced Figures provided by Ute Water)

Year		Finished Water Produced (1,000 gals)	Finished Water Produced (acre-feet)	Depletion (Make-up Flows per 1998 BO, Table 3) (acre-feet)
1996		2748962	8436.83	651
1997		2702366	8293.82	597
1998		3050824	9363.27	1100
1999		2974673	9129.56	996
2000		3168310	9723.85	1309
2001		3175790	9746.81	1309
2002		3420500	10497.84	1673
2003		3068990	9419.03	1152
2004		3122030	9581.81	1204
2005		3116970	9566.28	1204
10 year average				1119.5
2006 not yet available				

B. Bald Eagle, Direct and Indirect Effects

Any adverse direct effects would occur during the construction phase, when noise, dust, and increased human activity could make Hunter Reservoir less attractive as a foraging site for migrating individuals. Following construction and revegetation, Hunter could be more attractive to migrating eagles due to the enhanced fishery at the site as mentioned above. The enhanced fishery may, however, bring increased human activity as recreationists take advantage of new fishing opportunities. Returning the access road to a primitive state should insure that human activity does not increase significantly over pre-construction levels.

Cumulative Effects (ESA)

Cumulative effects for bald eagle are similar to those for Canada lynx described below.

C. Canada Lynx, Direct and Indirect Effects

Effects on individual lynx potentially using Leon Creek drainage (disturbance): Noise and associated human activity related to construction and maintenance activities have the potential to displace any lynx that may be using the area during the time that activity is taking place. Summer is the season when lynx are most likely to make exploratory moves outside their home territories (Ruediger et al. 2000), so construction during that time would have the greatest impact on lynx movement. Indirect effects would involve possible reductions in prey populations, as well as introduction of lynx competitors through additional snow compaction.

Effects on denning and foraging habitat: Potential effects of the Selected Management Action were identified based on a review of the scientific literature, contacts with local specialists, field surveys, and the best professional judgment of resource specialists (Table G-3). Ruediger et al. (2000) speculate that winter activities which compact the snow adversely impact lynx by permitting access to lynx habitat by lynx competitors such as coyotes. Snowcats, snowmobiles, and even cross country skiers and snowshoers compact snow and provide trails which coyotes and possibly red foxes may exploit. A designated snow compaction route passes within yards of the present high-water mark of Hunter Reservoir and will have to be relocated as part of the project. No additional snow compaction will result from the Selected Management Action.

Table G-3. Vegetation Types and Acreages Affected by Selected Management Action

Vegetation Type	Hunter Reservoir (acre)	Existing Access Road	New Access Road
Spruce/fir (lynx denning)	17.5	0.3	2.7
Willow/riparian (foraging)	11.8	1.2	<0.1
Grass/forb/shrub	55.0	0.1	<0.1

The project will result in the loss of approximately 20 acres of denning and 12 acres of foraging habitat.

Summary of effects on lynx habitat: The Selected Management Action will result in the permanent removal of 20.2 acres of denning habitat (17.5 acres for the reservoir, 2.7 acres for the new access road) and 11.9 acres of foraging habitat. Since this habitat (except for the road) will be replaced by open water, mitigation measures are limited, but possibilities include implementing timber and grazing management practices aimed at improving the quality of the remaining habitat in the project area.

Cumulative effects (ESA): Cumulative effects, consisting of future Federal and non-Federal actions, were analyzed as to how they may affect lynx habitat within the project area. Most of these actions consist of future natural gas development and home construction on adjoining private lands. The private land is a combination of agricultural and rural residential, with continued recreation and vacation home development at nearby Vega Reservoir. Based on discussions with District personnel, Mesa County officials, and the CDOW, there are no known State or private actions that have the potential to affect lynx or lynx habitat within the project area.

The following cumulative effects were identified:

Water development: Domestic and agricultural water developments have been extensive across the Grand Mesa National Forest. Construction of reservoirs, ditches, and domestic water sources has resulted in regulation of most free-flowing waters and naturally impounded waters on the Grand Mesa. Current water policies do not support strategies to protect and maintain flows. Surface water diversions for agriculture and municipal use are expected to continue and increase.

Within the project area, the Selected Management Action is the only new water project under consideration.

Livestock grazing: Livestock grazing has been a common practice on the lands of western Colorado for many decades. Historic over-grazing has been reported as a factor in the decline or loss of riparian areas, as well as modifying some forest understory habitats, particularly in aspen forests. Changes in grazing management were initiated as part of allotment management plan revisions in the 1980's. These revisions have aided in the reduction of grazing impacts to wetlands and riparian areas and resulted in greater stability for these habitats. Effective management of livestock grazing in the project area will help minimize impacts to riparian areas and subsequently reduce potential impacts to the associated wildlife and fish species.

Fire management: Prescribed fire activities have been concentrated in the shrubland and oakbrush communities on south-facing slopes of the Battlement Mesa, north of Collbran, Colorado, outside of the project area. The objective of reestablishing fire intervals in these plant communities is to reduce natural fuel buildup and improve browse for big game species. There have been no historic prescribed burns in the project area. The frequency of wildfires on GMUG may increase as vegetation communities continue to develop and fuels consequently increase. The potential impacts of wildfires may be severe to sensitive species, affecting individuals directly and indirectly by destroying occupied habitats. Current fire suppression is expected to continue with a priority to protect privately owned lands. There are no plans to use prescribed fire in the project area within the next five years.

Timber management: Past timber harvests of Engelmann spruce, subalpine fir, and aspen have occurred across GMUG. Historic timber management practices have had varying impacts on sensitive species, ranging from directly removing suitable habitats (adverse) to providing regenerated habitat types (favorable). It has been proposed that removal of spruce/fir timber required by the Selected Management Action be treated as a conventional timber sale.

Recreation: Historic recreational opportunities within the project area include fishing, hunting, and firewood gathering. Light dispersed camping occurs during the summer months with heavy dispersed camping occurring during the fall big game hunting seasons. Winter uses include cross-country skiing, snowshoeing, and snowmobiling. Dispersed recreational activities are believed to seldom result in direct loss of species habitat but may adversely affect individuals. Summer and winter recreational use levels are relatively high and are expected to increase as the number of users increases. There are currently no winter recreational special use permits that promote compaction of snow layers within the Flat Tops LAU. NFSR 280 and 262, which provide access to Hunter Reservoir, are primitive four-wheel drive roads which are part of an extensive network of winter snowmobile trails. As such, they are designated snow compaction routes for the purposes of lynx habitat management.

Forest Plan Direction:
Road construction is addressed by the LCAS (Reudiger et al. 2000), but the Selected Management Action will produce no net increase in road densities, nor will it affect the classification of existing roads.

IX. EFFECTS DETERMINATION

Colorado River Fishes: The Selected Management Action will result in a very slight depletion in Colorado River flows. However, this depletion has previously been consulted upon (BLM 1998, FWS 1998). A Biological Opinon was issued on February 4, 1998, with reasonable and prudent alternative to avoid jeopardy.

Bald Eagle: Based upon the potential for long-term improvement in foraging habitat at Hunter Reservoir, the Selected Management Action **may affect, not likely to adversely affect** this species. This determination is also based upon the lack of records documenting use of Hunter Reservoir by migrating individuals.

Canada Lynx: This analysis indicates there will be no additional snow compaction, no permanent increase in human activity, and no increase in road density as a result of the project. However, approximately 32 acres of habitat will be removed, and there are recent records of lynx use of the area. Therefore, the Selected Management Action **may affect, likely to adversely affect** the Canada lynx.

X. ADDITIONAL RECOMMENDATIONS AND MITIGATION MEASURES

No additional mitigation measures are recommended.

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