ADDENDUM TO APPENDIX 3-2

SYNOPSIS OF RIPARIAN BASELINE INVENTORY OF CRANDALL CREEK
AND
REVIEW OF BASELINE RIPARIAN INVENTORY OF CRANDALL CREEK
FOR PROPOSED CRANDALL MINE EXPANSION

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8/15/95 REVISED 10/1/95

Addendum to
Appendix 3-2

Synopsis of Riparian Baseline Inventory of Crandall Creek
and
Review of Baseline Riparian Inventory of Crandall Creek for Proposed Crandall Mine Expansion

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SYNOPSIS OF RIPARIAN BASELINE INVENTORY OF CRANDALL CREEK

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PREPARED BY ENVIRONMENTAL INDUSTRIAL SERVICES

AUGUST, 1995

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A complete inventory of all resources potentially affected by Genwal's proposed expansion within the riparian area was conducted between July and October of 1994 by employees of Environmental Industrial Services (EIS). Soil, hydrology, vegetation, and wildlife resources were inventoried by EIS, in cooperation with the USFS, Utah Division of Natural Resources (UDWR), and Soil Conservation Service (SCS). Cultural and archeological resources were inventoried by SENCO-PHENIX Archeological Consulting Services. All inventories were established on representative baseline(s) located along the length of the riparian corridor. Soil samples, hydrologic information, macrobenthic surveys, and inventories of wildlife resources were founded on twelve baseline transects, coinciding with established vegetation transects.

A soil survey, using U.S. Army Corp of Engineer standards, was conducted to determine the presence of hydric soils within the area of disturbance. Six soil pits were located randomly throughout the riparian corridor. Of the six samples sent to Intermountain Laboratories for analysis, two indicated possible hydric soil development. Two soil pits were located upon the small bench above the riparian corridor. Of these samples, one indicated the presence of hydric soil, the possible result of spring and seep activity.

A cultural resource inventory was conducted between August 18 and 22, 1994 by SENCO-PHENIX. No cultural resources were located and a archeological clearance for the proposed expansion was recommended.

An inventory of the vegetation present within the area of the proposed action consisted of thirty one transects within the riparian corridor and eleven on the adjacent bench. The community cover sampled consisted of a mix of grassy slopes, deciduous and coniferous clusters, and shrubby stretches bordering the narrow wetted zone along Crandall Creek. Vegetation cover was determined to be relatively high (> 70%), but not diverse. Species competition decreased as distance from the wetted zone increased. It was determined that diversity of species is limited by the availability of water and the resultant competition by hardier xeric species on the slopes above the riparian zone.

In meetings conducted with the USFS and UDWR during June and July of 1994, wildlife issues identified included the impact to fisheries, macrobenthic communities, neotropical bird use habitat, threatened and endangered species (T&E), raptor habitat, and big game use. No T&E plants were identified during the vegetation inventory. A review of T&E wildlife species that could occur within the area was conducted. Raptor species were identified as the most likely T&E species to be affected. A ground based inventory of raptor species was conducted but did not yield the presence of, or use by such species.

Bird species were identified during the course of the riparian inventory. Use by neotropical bird species, such as hummingbirds (**Selasphorus** spp.) was quite evident. Neotropical utilization of the area is most likely limited to energy use requirements rather than for nesting activity.

A macrobenthic community study indicated that structure of the community within Crandall Creek is based on a site-specific, autochthonous food base, with little reliance on the transport of food sources into the area. The majority of macrobenthic feeders found were gathering collectors. These feeders rely heavily on the abundant slow water areas where coarse particulate organic matter (CPOM) is abundant.

A fisheries inventory of Crandall Creek was performed by the UDWR on August 18, 1994. A UDWR review of that inventory is attached as ATTACHMENT 1.

A review of big-game impacts was also conducted. Impacts to mule deer (**Odocoileus hemionus**) and elk (**Cervus elaphus**) are expected to be limited, since no unique properties required by the local populations exist within the site. Use by moose (**Alces alces**), black bear (**Ursus americanus**), and mountain lion (**Felis concolor**) could occur, but is most likely limited to undisturbed areas above the area of the proposed action. Use by numerous small mammals was identified and an impact to them would occur. However, none were identified to be threatened, endangered or sensitive.

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ATTACHMENT 1

UDWR FISHERIES INVENTORY REVIEW

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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

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August 11, 1995

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Allan Childs
General Manager
Genwall Mining Co.
P.O. Box 1201
Huntington, Utah 84528

The sampling efforts on Crandall Creek from 1994 and 1995 indicate that the stream has a small resident population of cutthroat trout and is used as a spawning tributary by trout from Huntington Creek. The streams role as a spawning site for cutthroat trout in Huntington Creek is an important one and efforts should be made to protect it. Most of the usable spawning area is unfortunately within the area proposed to be altered by the arch culvert. I have enclosed graphs of our data.

Sincerely yours,

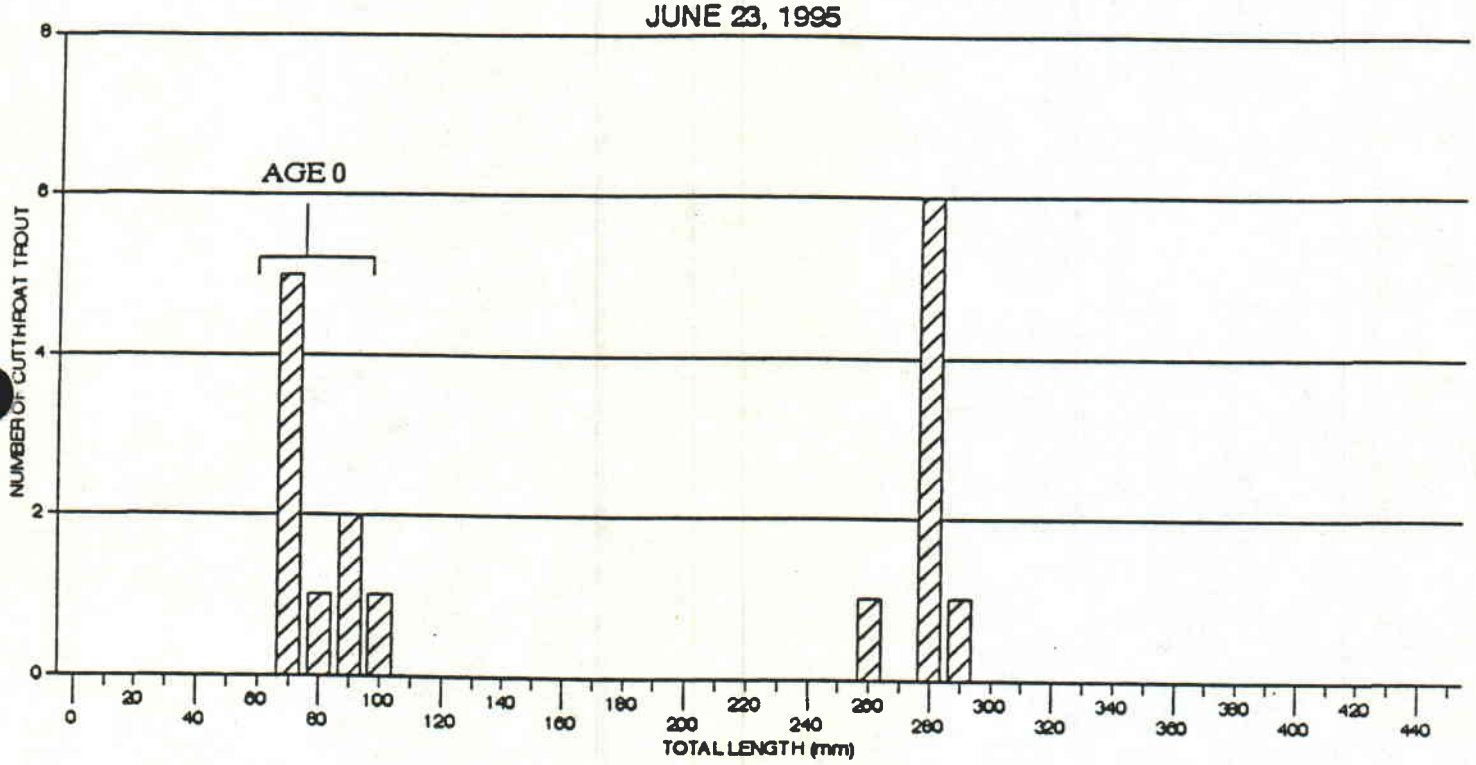
Miles Moretti
Regional Supervisor

cc: Mel Coonrod

D:DATA\HUNTINGT\RFHUNT95CRANDA

CRANDALL CANYON CREEK

JUNE 23, 1995



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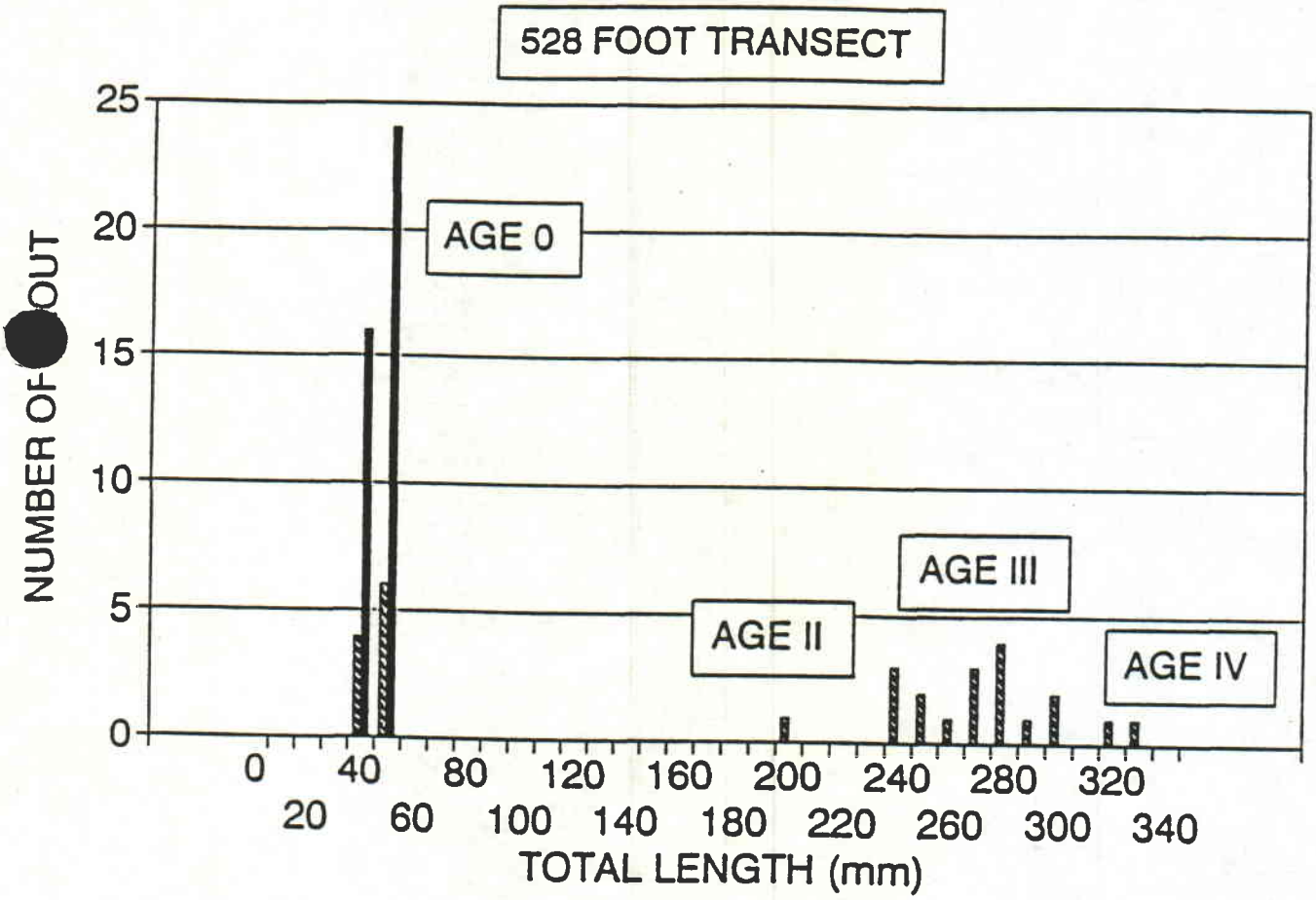
CRANDALL CANYON CREEK
AUGUST 18, 1994/NEXT TO MINE



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REVIEW OF BASELINE RIPARIAN INVENTORY OF CRANDALL CREEK

PROPOSED CRANDALL MINE EXPANSION

GENWAL COAL COMPANY

PREPARED BY

DAVID STEED
OF
ENVIRONMENTAL INDUSTRIAL SERVICES
HELPER, UTAH

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INTRODUCTION

It is the intent of the Genwal Coal Company to expand the operational capability of the Crandall Canyon Mine in Emery County, Utah. Current operations are located 1.5 miles from the junction where Crandall Canyon joins Huntington Canyon. Disturbance at the present is limited to the northern slope above the small, second-order Crandall Creek. The proposed expansion includes land acquired by Genwal Coal Company on the southern slope of the canyon, directly across from current operations. This acquired area is currently maintained as undisturbed, and/or is outside of the present permitted area. A primary consequence of expansion is the limited disturbance to the hydrological, vegetative and ecological nature of approximately 1000 feet of riparian community along Crandall Creek and the deciduous/coniferous community that dominates its southern slope. "Riparian community" refers to all resources that constitute the area of the proposed disturbance.

The deciduous/coniferous community predominant on the southern slope has been previously inventoried for past mining operational plans. The riparian corridor and nearby riparian bench have not been inventoried in the past. The planned area of disturbance includes 1000 feet of riparian community situated within a narrow V-shaped corridor along Crandall Creek. 40 to 70 percent slopes, covered with thick shrubs and trees such as Woods rose (**Rosa woodsii**), red-oiser dogwood (**Cornus stolonifera**), and willows (**Salix spp.**), border the confined greenline of forbs and grasses. Adjacent to the corridor is a quarter acre bench covered with emergent quaking aspen suckers (**Populus tremuloides**) and many small shrubs. This area is transitional in nature due the effects of past fires. Vegetation is a mixture of riparian species and plant life indicative of the deciduous/coniferous community on the slopes above.

Meetings with local state and federal agencies were conducted in July of 1994 to identify the potential impacts of disturbance. Foremost in importance was the potential elimination of 1000 feet of riparian community. Impact to species that utilize the area for energy and cover requirements was also discussed. Plans to culvert the creek throughout the length of disturbance was unfavorably reviewed by agency personnel, since it would create a significant "block" to the movement of fish species. It was recognized that the extent of biological resources was not sufficiently known in which to make a decision on the magnitude of impacts associated with mine expansion. Inventories of resources inherent to the area were thus planned before any decisions as to agency stance on the project would be made. Resource issues identified and discussed for further study include:

* Impacts to, and the extent of riparian vegetation
* The possibility of wetlands within the corridor
* Location of any cultural resource within the corridor

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* The extent of the fish community within the area, and how it would be impacted
* The community structure of macrobenthic organisms
* Use of the area by migratory (Neotropical) birds
* Importance of the area to big-game species
* Impacts to downstream resources and the Huntington Canyon drainage

A review of meetings conducted is included in **ATTACHMENT 1.**

Due to the irregular and unique nature of the small area of disturbance, a full inventory; rather than a statistical comparison of the riparian community, was conducted. A major influencing factor for this decision was that a suitable reference area could not be found within the boundaries of the proposed disturbance. Due to the close proximity of U.S. Forest Service (USFS) land above and below the affected area, a reference area was restricted to the area of disturbance. Since vegetation cover varied significantly throughout the length of the affected community, the option of finding a representative section elsewhere was eliminated.

A complete inventory of all resources potentially affected by Genwal's expansion plans within the riparian area was conducted between July and October of 1994 by employees of Environmental Industrial Services (EIS). Soil, hydrology, vegetation, and wildlife resources were inventoried by EIS, with cooperation from the USFS, Utah Division of Natural Resources (UDWR), and Soil Conservation Service (SCS). Cultural and archeological resources were inventoried by SENCO-PHENIX Archeological Consulting Services. All inventories were established on representative baseline(s) located along the length of the riparian corridor. Soil samples, hydrologic information, macrobenthic surveys, and inventories of wildlife resources were founded on 12 baseline transects, coinciding with established vegetation transects.

HYDRIC SOIL INVENTORY

Previous inventories of soil resources, as required by the Utah Division of Oil, Gas and Mining (UDOGM) for current operational activities, are adequate for area soil description. However, soils along the riparian corridor and bench proposed for inclusion in expansion plans have been largely ignored, and require some method of identification. It was not the intent of this survey to identify the soil types present, but rather to determine the occurrence of hydric type soils.

A high probability of hydric soils; a indicator for the presence of wetland areas, exists within this area due to the saturated hydrological regime that exists there. Numerous beaver ponds throughout the length of the potential disturbance have resulted in

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saturated soil conditions along areas below the bankfull level of the creek. Areas of concern within this study are those sections along the corridor above the bankfull mark and on the adjacent bench.

Methodology and Inventory Procedures

Methodologies based on procedures established by the U.S. Army Corp of Engineers (USACE), Corp of Engineers Wetland Delineation Manual, 1987 Edition for the identification of hydric soils were used. The procedures for the determination of wetland soils in both organic (nonsandy) and sandy soils incorporated into this study were:

* Determining the presence of organic soils (histosols)
* Determining the presence of organic material in surface horizon, or streaking of organic material in subsurface horizons (sandy soils)
* Determination of a saturated A horizon (histic epipedon)
* The indication of a reducing environment (sulfidic material or presence of ferrous iron)
* A completely saturated soil structure (aquic or peraquic)
* Use of a Munsell Color test (nonsandy soils only)
* Determining the presence of an organic "pan"

The inventory of possible hydric soils was accomplished with the excavation of six (6) soil pits randomly located along the riparian corridor. Pits were located along the channel banks, so as not to sample recently deposited material or exposed channel substrate. Care was taken to obtain the most representative sample for the area as a whole. As material was excavated down to parent material, composition was noted. Soil moisture was also noted for each sample, as was depth of the organic layer. A composite sample was collected for each of the 6 samples, since significant horizon formation was determined to be absent.

Two (2) representative samples were collected from the adjacent bench in the same manner as those along the riparian corridor. Only 2 samples were collected due to the uniformity of the bench and its small area (200' x 50'). A composite sample was collected due to a lack of substantial horizon formation. The presence of possible hydric soils was also inventoried in this location using the USACE guidelines.

Samples collected were sent to Intermountain Laboratories (IML) for analysis. Analysis performed on each sample was based on UDOGM methodology for baseline soil data.

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Field and Laboratory Results

On-site field investigation of the riparian corridor and adjacent bench indicated the potential for hydric soils. Field inventory concluded that Riparian SS 5 and 6 were possibly hydric, as well as Bench SS 1. Riparian SS 5 and 6, Entisols located above the bankfull mark on the northern bank of Crandall Creek, were saturated throughout their depth to parent material (preaquic). The presence of thick organic layers within these two samples were also identified. Bench SS 1 was saturated and contained a 1 inch organic pan 11 inches below the surface.

Saturation levels were high for Riparian SS 5 and Bench SS 1 and 2. Levels for pH were not expected to be so high along the riparian corridor (7.5 to 7.7). Munsell Color tests performed on the composite samples were not satisfactory in determining hydric soil identification, since the samples analyzed were sandy. All results of the analyses performed by IML are shown in **ATTACHMENT 2**.

According to data reviewed on past soil surveys conducted within the ares, soils that make up the steep hill sides and upper portion of the channel may be loamy-skeletal Typic Cryoborolls with little soil moisture. The bench is potentially composed of skeletal Typic Cryoborolls (90 percent) with an inclusion of Histic Cryaquolls (10 percent). Field observations concurred with prior surveys. Actual soils surveyed within this study did resemble soils with distingushiable horizon development, though the samples taken were not developed soil types

A hydrological influence to soil resources is inherent to a riparian area. All soil along the greenline; that area where a continuous cover of vegetation has resulted from the presence of a saturated environment, is to some degree hydric in nature. Though Samples 5 and 6 were identified as hydric soils, their presence along the channel within the narrow riparian corridor would assume this. Therefore, the presence of these 2 samples are not a significant indicator of a wetland community

It is the presence of the hydric soil sample taken on the adjacent bench that is questionable. Bench Sample 1 was located uphill and over 100 feet away from the true greenline corridor. The influence of the wetted channel is doubtful. Runoff from the steep slope above the bench may have resulted in a deposition area, and a subsequent saturated environment. The presence of a seep or spring may too have resulted in the location of this inclusion.

CULTURAL RESOURCE INVENTORY

A cultural and archeological on-site inventory, in conjunction with a review of pertinent literature to the site, was conducted by SENCO-PHENIX on August 22, 1994. A copy of the report prepared is shown in **ATTACHMENT 3**.

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VEGETATION INVENTORY

Introduction

The current vegetation inventory took into account the previous evaluation of the deciduous/coniferous community, past disturbances, and the diverse nature of this stretch of Crandall Creek. Vegetation along this particular section is varied throughout the 1000 feet, due to past disturbances from fire and grazing. Series of beaver ponds, rock outcroppings and steep side slopes have also contributed to an intermittent vegetation cover along the length of the corridor. The community cover in general, is a mix of grassy slopes, deciduous and coniferous clusters, and shrubby stretches that border a relatively narrow wetted zone along the creek.

Methodology

A total of forty-two (42) transects were randomly located within the affected riparian community. Thirty-one (31) transects were located across the length of the riparian corridor and eleven (11) were established upon the small bench. Ground cover sampled was based on the point intercept method, using a modified ten-point frame. At ten (10) foot intervals along each transect line, twenty (20) sample "points" were gathered with the use of the modified ten-point frame by placing it along each "side" of the point on that line.

Along the riparian corridor, the length of each transect depended upon the dimensions of the corridor at that location (length of slopes and channel width), and the distance to a differing community type. This distance ranged from sixty (60) feet to one hundred (100) feet. Transects on the riparian bench, however, were measured to one hundred (100) feet and located along its entire length. The location of the bench transects were situated as to maximize sampling of the bench and to prevent any double sampling of points assessed by sampling of the nearby corridor.

The type of ground cover at a given point was determined as being: a) bare: no litter or vegetation; b) rock: made up completely of rock or rock material; c) litter: dead or dying organic material; and d) vegetation: living organic material (i.e. plants). Vegetation was classified as being either a grass, forb, shrub or tree, the intercept point for a given plant being defined by the crown (as in forbs, shrubs, and trees) or by the basal portion (as in grasses). All vegetation species were identified in the field.

The points collected were used to determine the density (percent of cover) for a given cover type within the riparian community. Due to slight differences in vegetation composition, points from the bench area were not included with those from the corridor, and were separately analyzed for cover determination. Methodology for each area, however, remained the same. Calculation of percent cover was accomplished with the following equation:

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$$\text{percent cover} = \frac{\text{no. of points for cover type}}{\text{total no. of points}}$$

Species richness (s), abundance (n), relative abundance (p) and diversity (H') were also determined. Diversity was determined by first obtaining relative abundance, which is defined as proportion of species that make-up N:

$$\text{relative abundance} = p = n/N$$

Where: n = total points for individual species
N = total points for all species

Diversity, defined as the amount of evenness among species, was then calculated using the equation:

$$\text{Diversity} = H' = \text{SUM OF } p\text{LOG10}p$$

The higher the diversity (H'=1.00) value, the higher the evenness, or diversity of species and trophic levels within that community. The lower the H' value (H'=0.00), the less even and diverse the community.

Productivity measurements were not made during this study. The SCS will be contacted at a later date in order to determine this value.

2940 points were collected along the riparian corridor. Of these points, 193 were bare, 189 were rock, and 439 were litter. Vegetation points totaled 2119 points and consisted of 239 grass points, 395 forb points, 867 shrub points and 618 tree points. Percent cover for the corridor was calculated as:

Bare	6.57%
Rock	6.43%
Litter	14.93%
*Vegetation	72.08%

* grasses	8.13%
forbs	13.44%
shrubs	29.49%
trees	21.02%

Cover was also calculated for vegetation points only (N = 2119 points):

Grasses	11.30%
Forbs	18.64%
Shrubs	40.92%
Trees	29.16%

41 species of vegetation made up the cover along the slopes and banks of the riparian corridor. Species richness was determined to be: grasses (s=11), forbs (s=14), shrubs (s=10) and trees (s=6).

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Diversity was determined to be H'=0.59 for grasses, H'=0.96 for forbs, H'=0.54 for shrubs and H'=0.52 for trees. All information, including relative abundance, is shown in **ATTACHMENT 4**.

Bench points totaled 2200 points, of which 190 were bare, 27 rock, 351 litter and 1632 vegetation. Grass points totaled 106 points; forbs, 109 points; shrubs, 621 points; and trees, 796 points. Percent cover was calculated as:

Bare	8.64%
Rock	1.23%
Litter	15.96%
*Vegetation	74.18%

*	grasses	4.82%
	forbs	4.95%
	shrubs	28.23%
	trees	36.18%

Percent cover for vegetation points only was also calculated for the bench area:

Grasses	6.50%
Forbs	6.68%
Shrubs	38.05%
Trees	48.78%

30 species were inventoried on the bench. Species richness was determined for grasses (s=7), forbs (s=10), shrubs (s=6) and trees (s=7). Diversity was H'=0.46 for grasses, H'=0.80 for forbs, H'=0.61 for shrubs and H'=0.48 for trees. This information, along with relative abundance, is shown in **ATTACHMENT 4**.

Vegetation cover was relatively high (> 70%) over the area of proposed disturbance. Species richness and diversity within the corridor and the bench, however, do not reflect a highly even community. Evenness is a reflection of the stability of the community. The higher the diversity (H'), the more trophic layers present and thus the more even the community. With the exception of forb species, diversity for the corridor and adjacent bench is low, considering the influence of the wetted hydrological regime associated with the creek in the narrow corridor. Species composition decreases as distance from the creek increases. The steep slopes (40 to 70 percent) that border the riparian corridor and bench are not as directly effected by the wetted channel, and tend to be covered with abundant xeric shrub species which do not have the water needs of the lush grasses, forbs and trees that border the creek. Diversity of species is thus limited by the availability of water and the resultant competition by hardier species on these slopes.

The influence upon the bench by the adjacent riparian corridor does not seem to be of a benefit to species diversity and richness. Moisture accumulations associated from winter snowpack and spring

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runoff, have resulted in the high density of emergent quaking aspen (**Populus tremuloides**). Past disturbance to the bench by fire has resulted in the high density of transitional aspen "sucker" shoots. The high abundance of transitional shoots (<2 Inch Diameter) do not correctly reflect the amount of true trees upon the bench. Through competition and water restrictions, the majority of shoots sampled could in effect die out or be replaced by another cover type.

High shrub abundance is as expected. A drier environment (except for a small wetted inclusion at its western end) exist over much of the bench, establishing conditions that inable shrub species to compete more successfully for resources than other cover types. Due to interspecies competition, diversity of species is lower. Forb diversity, however, is high and may be the result of the wetted inclusion where soil moisture conditions allow for more mesic and lush vegetation cover to exist.

WILDLIFE RESOURCES

On June and July of 1994, meetings with the Price, Utah offices of the USFS and UDWR were conducted to determine the potential threats as to the yet unidentified resources of the area. Using information gathered from past studies associated with the current operations of the Crandall Canyon Mine and knowledge inherent to the study of riparian areas, the issues identified included:

* Impact to fisheries resources
* Status of macrobenthic communities
* Neotropical bird habitat/use
* Threatened and endangered species
* Raptor habitat/use
* Big game habitat/use

In conjunction with the UDWR, inventories to determine the presence or extent of these resources were designed and conducted in August, 1994 by David Steed and Todd Welty of EIS. Assistance with Neotropical bird identification was provided by Ben Morris of the UDWR. Fisheries sampling and data analysis was conducted by the UDWR under the direction of Ken Phippen, Ben Morris and Derald Anderson. A synopsis of all surveys conducted is as follows:

Threatened and Endangered Species & Raptor Inventories

The vegetation inventory conducted did not reveal the presence of any threatened and endangered (T&E) plant species. Surveys conducted for fishery resources in Crandall Creek revealed only the presence of a small population of Yellowstone cutthroat trout (**Oncorhynchus clarki bouvieri**), a common species to the Huntington River Drainage (See Fisheries Resources).

No amphibians or reptiles were located during any of the surveys conducted. Occurrence of the Spotted frog (**Rana pretiosa**) was considered, but deemed unlikely. An inventory of the creek bottom

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did not reveal the presence of any frog species.

Pre-survey literature research revealed the potential for the presence of T&E avian species. A review of a raptor survey conducted by the UDWR during October of 1993 indicated the presence of T&E raptor species within the area. The occurence of Bald eagles (**Haliaeetus leucocephalus**) and Peregrine falcons (**Peregrinus anatum**) was considered. A ground based inventory was designed to complement the 1993 survey and to evaluate the presence of T&E avian species in and around the riparian corridor.

A survey, conducted on August 19, 1994 by employees of EIS, was based on a 25 foot grid system situated on each of the baseline(s) established for inventory of the riparian area. A 360 degree optical search was carried out on each baseline and at all corners of the "grid". No nests for any avian species were located and no T&E raptor species were identified within the area of the riparian corridor and adjacent bench. A copy of the 1993 UDWR raptor survey is shown in **ATTACHMENT 5**.

Neotropical Birds

The identification of bird species sighted within the riparian area was conducted during each survey. The presence of neotropical species) was quite evident. Though hummingbirds (**Selasphorus spp.**) utilize the area of the riparian corridor for energy requirements while migrating, no unique properties that would significantly impact bird species were noticed to be inherent to the area. No nests or the sign of nesting activities were found along the riparian corridor. A complete list of bird species visually identified during the months of July, August and September is shown in **ATTACHMENT 6**.

Macrobenthic Community Structure

An inventory of macrobenthic resources within Crandall Creek was conducted on July 21, 1994. 12 sample sites were located on established baseline(s) relative to water speed and quality. Deep ponds, shallow pools, ripples and fast "rapid" areas were sampled using a 30.5 cm x 30.5 cm, 900 micron mesh Surber sampler. Samples were set apart based on water speed and related detritus deposition: 6 fast water (3 rapids/3 ripples); and 6 slow water (3 pools/3 ponds). Substrate at the site of rapid/ripple samples was thoroughly scrubbed to obtain all organisms present. Where samples were taken for ponds or pools, depositional sediment and detrital material prevented collection to substrate. Slow water samples were thus collected in shallow areas above and below the pond or pool.

Samples were sorted and all organisms present were identified to the family level. Benthic organisms were then placed into their respective functional feeding group, based on methodology by Cummins and Wilzbach, 1985; Minshall, 1992; and that used by the U.S. Forest Service (USFS) for evaluation of stream riparian area

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conditions.

A total of 329 organisms were sampled along the length of the creek. ATTACHMENT 7 shows the breakdown based on water speed of the functional feeding group structure found in Crandall Creek.

How these feeding groups stand in relation to one another and the type of food that each functional group utilizes both indicate the health of a stream. Due to the higher abundance of Scrapers than Shredders, macrobenthic community structure seems to be based upon a autochthonous (site-specific) food base, rather than reliance of the transport of food sources into the area. The abundant ponds and slower water areas (ripples and pools) provide for ample concentrations of fine particulate organic matter (FPOM), coarse particulate organic matter (CPOM) and large woody debris upon which both Shredders and Scrapers utilize. Gathering Collectors are also higher due to the depositional character of the stream. Filtering Collectors require rapid water flow to aid food acquisition and are, thus limited to the short fast sections. Predator numbers are relatively high in the pool/pond areas due to the abundance of other feeding groups upon which they feed.

Fisheries Habitat

An inventory of fish species was conducted by the UDWR on August 18, 1994. Electro-shocking of the creek revealed only the presence of Yellowstone cutthroat trout. The results of analysis of age distribution of species sampled, relative to population and community structure, and rough data generated by the UDWR study is shown in ATTACHMENT 8.

Big-Game Habitat

No big-game species were observed while inventories of the affected area were being conducted. The presence of Mule deer (**Odocoileus hemionus**) within the riparian corridor was recognized by hoofprints along the banks of the creek and game trails descending from the deciduous/coniferous slopes above. The riparian area provides nutrient requirements for deer species, where vegetation cover, particularly forbs and grasses, provides an ample forage base. Impact to deer is expected to be limited to their use of the affected area. Since no unique properties within the area were noted, this impact should not excessively affect deer populations.

The presence of elk (**Cervus elaphus**) was not identified but they are known to occur within the area. Any impact to elk populations is expected to be minimal.

Utilization of the affected area by moose (**Alces alces**) is possible, but most use likely occurs in the areas of thick shrubs and abundant forbs above and below the area planned for disturbance.

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Other Wildlife Resources

Use of the affected riparian community by other mammalian species was considered as well. Use by small mammals was observed, especially use by Red squirrels (**Tamiasciurus hudsonicus**) and Uintah chipmunks (**Tamais umbrinus**). Abundant downfall and rocky side slopes provide excellent cover for squirrel species.

Many old beaver dams are located along the length of the affected creek, but no beaver (**Castor canadensis**) were located. Long-tailed weasel (**Mustela frenta**) and possible Raccoon (**Procyon lotor**) tracks were located at the inlet of ponds created from past beaver activities.

Use by larger mammals, such as the Black bear (**Ursus americanus**) and Mountain lion (**Felis concolor**) is possible, but is most likely is limited to undisturbed sections of the creek above and below the mine The increase in disturbance resulting from expansion plans should not detrimentally affect these species.

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LITERATURE CITED

Jensen, Earl H. and Borchert, James W. 1988. Soil Survey of Carbon Area, Utah. USDA Soil Conservation Service. 294 p.

Environmental Laboratory. 1987. Corp of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. 169 p.

Cummins, Kenneth W. and Wilzbach, Margaret A. 1985. Field Procedures for Analysis of Functional Feeding Groups of Stream Macroinvertebrates. Appalachian Environmental Laboratory. University of Maryland. 19 p.

Genwal Coal Company. 1988. Mining and Reclamation Plan: Crandall Canyon Mine. Volume 3.

Minshall, G. Wayne. 1992. Inventory of Select Idaho Streams, Order 1-3. Personal Papers

Platts, William S.; Armour, Carl; et al. 1987. Methods for Evaluating Riparian Habitats With Applications to Management. General Technical Report INT-221. Ogden, Utah: USDAFS, Intermountain Research Station. 177 p.

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ATTACHMENT 1

REVIEW OF PRE-STUDY MEETINGS WITH USFS AND UDWR

ENVIRONMENTAL INDUSTRIAL SERVICES
4855 N. Spring Glen Rd., Helper, UT 84526 · Telephone (801) 472-3814 · FAX (801) 472-8780

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July 7, 1994

Utah Division of Wildlife Resources
455 W. Railroad Avenue
Price, Utah 84501

Attn: Ben Morris

Re: Site Visit to Area of Proposed Genwal Mine Expansion, Crandall Creek

Dear Mr. Morris:

The following is a summary of our site visit on 7/1/94 to the potential area of disturbance along Crandall Creek, resulting from the proposed expansion of the Crandall Canyon Mine by Genwal Coal Company. A preliminary scoping meeting with the Division on 6/23/94, had led to the identification of concerns relating to wildlife use and habitat present at the site. Among these concerns were:

* Status of Crandall Creek as a fishery
* Composition of macrobenthic community in Crandall Creek
* Designation of Crandall Creek as a wetland or riparian area
* Big game use of the potentially disturbed area
* Use by, and presence of neotropical birds

These concerns arose from the possibility of up to 1300 feet of disturbance to Crandall Creek. Conceivably, the length of the creek within the existing Genwal mine lease could be culverted, and or bridged. In order to measure the impact of the mine's development on wildlife resources and their habitat, it was determined that baseline information be gathered by our firm and the Division. I believe it was the intent of our meeting on 7/1/94 to shed some light on the quality of Crandall Creek and to provide a more informative direction on which to base our cooperative studies.

Location of Disturbance

The section of Crandall Creek potentially impacted is within the Genwal Coal Company lease in upper Crandall Canyon. Though an actual stream length within the lease is not known, the distance from the downstream permit boundary to the upstream boundary is approximately 1320 feet. The creek is most likely a first order

Sent 7/7/94 a.s.

stream, judging from its size (< 6 ft wide, < 3 ft deep) and close origin (< 5 mi). Little meandering was noted along the streams length within the permit boundary. Channel bed composition ranges from hard rock, to cobble, to silt. Numerous ponds have been formed from past beaver activity. Vegetation along the stream is mostly bushes and small grasses. Conifers overhang the majority of the streams length, providing extensive areas of shade. A small riparian area, composed of shrubs, forbs and grasses, exists where a mild bank/slope gradient allows for a more complex community development.

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Is Crandall Creek a Fishery?

During our site visit, trout (Salmo trutta?) up to 12 inches were seen. The presence of these fish indicate either an established population or a spawning ground, since the creek hasn't been planted for some time. It is in my opinion that since only one general size and age group was noted, that their presence is due to upstream spawning rather than an established year-round population. Regardless of the reason for their occurrence, a fishery evaluation and inventory will be conducted by the Division in August to determine the composition of the population now inhabiting Crandall Creek. During the course of all inventory work, the importance of this section and the upper reaches of Crandall Creek to cold water fish species will be evaluated.

What is the Composition of the Macrobenthic Community?

Though no macroinvertebrates were collected during this visit, I presume that benthic community composition is varied, judging from the fair velocity and cold temperature of the stream. Due to the high amount of coarse particulate matter available, shredder species are most likely dominant, with collector species being abundant as well. A complete benthic community and composition study will be initiated by our firm in order to determine the extent of this resource.

What is the Extent of Wetlands in the Potentially Disturbed Area?

Riparian development along the majority of the disturbed section of stream was extensive. Adequate bank cover was noted, as was the presence of stable, overhanging banks. Though the upper slopes above the stream showed the effects of past disruptions (grazing?), the channel and its surrounding riparian area (≤ 25 feet wide) seemed to be functioning. Excessive siltation was observed in most of the beaver ponds located. This is probably the result of upstream degradation to stream banks by grazing. Overhanging vegetation was abundant throughout the length of the permitted stream section, as was the amount of large woody debris within the stream channel.

A riparian inventory modelled after forest service methodology will be instigated by our firm this summer. The presence of actual wetlands were not located. A hydric soil inventory will be

implemented at the same time as the riparian inventory in order to determine the presence or potential for wetland areas.

What is the Importance of this Area to Wildlife?

The length of the stream within the permit area is bordered by adequate vegetation that could potentially be utilized by big game. During our visit, a female mule deer (Odocoileus hemionus) was observed to be feeding on vegetation within the riparian area directly below the permitted area. It is in my opinion that the permitted section holds considerable year-round value to wildlife. However, I don't believe that the withdrawal of this stream section from use and its resulting disturbance to the surrounding environment will significantly impact any wildlife species.

To accurately measure the use of this area by wildlife, we intend to implement a thorough threatened and endangered species inventory and habitat study. We realize that determining the value of an area to wildlife is difficult without the knowledge of past use, so it is also our intent to research past instances of wildlife utilization. Since no neotropical birds were identified during our visit, the status of this area as an aviary is still questionable. This to will be thoroughly studied and inventoried to accurately judge the areas value to bird species.

Summary

After seeing the site of the proposed expansion firsthand, and without knowing the actual location of the planned pad and portals, it was indicated that the presence of a culvert would be detrimental to any resource. A half-round, or possibly a series of bridges would seem to be an acceptable method to accessing the other side of the creek. Another concern was the effect of this expansion on downstream resources. It was agreed that during the course of all studies, that this impact would be considered. We also agreed that we would review past records for Crandall Canyon and Crandall Creek.

If you have questions concerning at all, please feel free to contact me. I will try to assist you in any way that I can.

Sincerely;

David Steed
Environmental Ecologist/Consultant

cc: File
Jay Marshall/Genwal

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ENVIRONMENTAL INDUSTRIAL SERVICES
4855 N. Spring Glen Rd., Helper, UT 84526 - Telephone (801) 472-3814 - FAX (801) 472-8780

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July 8, 1994

Paul Baker
Division of Oil, Gas & Mining
355 W. North Temple
#3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Dear Paul:

Concerning my inquiry on 7/8/94 relating to a proposed riparian inventory, we plan to follow your suggestion of a full baseline inventory of the riparian community present rather than the establishment of a set reference area. I believe your recommendation was based on the small size of the riparian zone (an average of 25 feet wide) and restrictions of the relevance of a reference section (1 acre) to the inventoried area (1300 feet). I appreciate the time and effort of your response to my questions. If you have any questions, or that I am wrong in my assumption of your recommendation, please feel free to contact me.

Sincerely,

David Steed
Environmental Ecologist/Consultant

CC: File
Steve Demczak/Price Office, DOGM
Jay Marshall/Genwal Coal Co.

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July 22,1994

Jay Marshall
Genwal Coal Co.
195 N. 100 W.
P.O. Box 1201
Huntington, Utah 84528

Re: Baseline status on properties associated with Crandall Canyon mine expansion

Dear Jay:

The following is a short summary of activities conducted up-to-date in regards to the proposed mine expansion in Crandall Canyon:

6/22/94 Meeting with Utah Division of Water Rights to discuss intentions of Genwal, concerns of the Division, and the potential impact to downstream water resources.

6/23/94 Meeting with Utah Division of Wildlife Resources to discuss the potential impact of mine expansion to indigenous wildlife resources and their habitat.

6/27/94 Meeting with representatives of the Manti-LaSal National Forest to discuss the potential impact of mine expansion to USFS resources up and downstream from the project, and possible mitigation actions for these impacts.

7/1/94 On-site meeting with Ben Morris of the Utah Division of Wildlife Resources to view the proposed area of disturbance.

Specific concerns identified through these meetings have been included in reports sent to Genwal on 7/5/94 and 7/6/94. The potential impact to downstream water quality is a primary concern as is the impact of culverting Crandall Creek. It is our understanding that all agencies contacted were opposed to a full culverting of Crandall Creek, due to the impact that this project may have on fishery resources in Crandall Creek and the Huntington drainage.

Baseline activities were initiated on 7/11/94. A complete riparian vegetation inventory was conducted through 7/20/94. An inventory of the aspen community located within the proposed area of disturbance is currently being conducted. Identification and

community structure of the macrobenthic organisms present within Crandall Creek is planned for the week of 7/25, as is soil inventory of the proposed disturbed area.

In August, the Utah Division of Wildlife Resources will be conducting an electroshock inventory of fishery resources in order to determine the actual status of Crandall Creek as a fishery. Though fish have been located within the creek, its actual status as a true fishery is not known. The Huntington River drainage is of special concern, since the only disease-free strain of Yellowstone cutthroat trout in Utah is located within its reaches. The possibility of any impact to this species will be closely scrutinized by the Division.

During all inventory work, raptor and neotropical birds have been noted and identified. The use of Crandall Canyon especially by neotropical birds, was a concern of the Division of Wildlife Resources since many of these species are federally listed as threatened. A complete Threatened and Endangered inventory will be initiated in August to determine the extent of such sensitive species.

Actual on-site data retrieval is approximately half completed. The analysis of data presently acquired should be completed by the end of July and at that time will be summarized in a report to Genwal. If you have any questions concerning our activities to date and those planned at Crandall Canyon, please call me and I would be happy to explain our ongoing projects and methodology.

Sincerely,

David Steed
Environmental Ecologist/Consultant

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ATTACHMENT 2

SOIL ANALYSIS RESULTS PREPARED BY INTERMOUNTAIN LABORATORIES

Inter-Mountain Laboratories, Inc.
2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

(E.I.S.) GENWAL COAL CO.
Helper, Utah
MINE: Mine
LOCATION: Riparian / Bench

DATE SAMPLED: August 19, 1994
DATE REPORTED: October 20, 1994

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Sand %	Silt %	Clay %	Texture	Organic Matter %
36374	SS 1 RIPARIAN		7.5	0.57	31.2	2.71	2.13	0.95	0.61	92.0	4.0	4.0	SAND	0.7
36375	SS 2 RIPARIAN		7.5	1.66	32.8	8.17	3.16	6.17	2.59	80.0	14.0	6.0	LOAMY SAND	0.8
36376	SS 3 RIPARIAN		7.7	0.81	34.7	4.73	2.82	1.05	0.54	76.0	16.0	8.0	SANDY LOAM	1.6
36377	SS 4 RIPARIAN		7.7	0.45	33.2	2.96	1.03	0.42	0.30	78.0	18.0	4.0	LOAMY SAND	0.9
36378	SS 5 RIPARIAN		7.7	0.66	46.1	3.71	2.10	1.17	0.69	70.0	22.0	8.0	SANDY LOAM	1.7
36379	SS 6 RIPARIAN		7.6	1.58	32.5	12.8	5.07	0.63	0.21	76.0	18.0	6.0	LOAMY SAND	1.0
36380	SS 1 BENCH		7.7	0.37	43.1	3.16	0.42	0.30	0.22	58.0	28.0	14.0	SANDY LOAM	3.1
36381	SS 2 BENCH		7.7	0.33	47.6	2.96	0.29	0.19	0.15	58.0	26.0	16.0	SANDY LOAM	3.6

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Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.
2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

(E.I.S.) GENWAL COAL CO.
Helper, Utah
MINE: Mine
LOCATION: Riparian / Bench

DATE SAMPLED: August 19, 1994
DATE REPORTED: October 20, 1994

Lab No.	Location	Depths	Carbonate %	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t	P ppm	Avail Na meq/100g	Exch Na meq/100g
36374	SS 1 RIPARIAN		12.6	-0.01	0.06	109.	109.	<0.01	<0.01	<0.01	-0.01	109.	2.90	0.33	0.30
36375	SS 2 RIPARIAN		8.0	-0.01	0.26	65.8	65.6	<0.01	<0.01	<0.01	-0.01	65.8	4.06	0.66	0.46
36376	SS 3 RIPARIAN		16.3	-0.01	0.27	153.	153.	<0.01	0.01	<0.01	0.36	153.	5.87	0.36	0.32
36377	SS 4 RIPARIAN		10.5	-0.01	0.06	96.5	96.4	<0.01	<0.01	<0.01	-0.01	96.5	3.56	0.28	0.27
36378	SS 5 RIPARIAN		14.1	0.02	0.62	138.	137.	0.01	<0.01	<0.01	-0.01	138.	4.92	0.36	0.31
36379	SS 6 RIPARIAN		9.6	-0.01	0.13	84.7	84.6	<0.01	<0.01	<0.01	-0.01	84.7	4.12	0.28	0.26
36380	SS 1 BENCH		4.0	-0.01	0.29	29.8	29.5	<0.01	<0.01	<0.01	-0.01	29.8	15.1	0.26	0.25
36381	SS 2 BENCH		9.7	0.02	0.57	89.3	88.7	<0.01	<0.01	<0.01	-0.01	89.3	6.83	0.25	0.24

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Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

(E.I.S.) GENWAL COAL CO.
Helper, Utah
MINE: Mine
LOCATION: Riparian / Bench

DATE SAMPLED: August 19, 1994
DATE REPORTED: October 20, 1994

Lab No.	Location	Depths	CEC meq/100g	ESP	K PE meq/l	Alkalinity PE meq/l	Total Selenium ppm	Bulk Density	Total Kjeldahl Nitrogen %	1/3 bar	15 bar	H2O Sol Selenium ppm
36374	SS 1 RIPARIAN		2.50	12.0	0.17	3.66	0.15		0.03	5.1	4.1	<0.02
36375	SS 2 RIPARIAN		9.00	5.08	0.20	2.80	0.15	1.24	0.03	7.2	5.1	<0.02
36376	SS 3 RIPARIAN		10.3	3.14	0.14	2.89	0.35	1.40	0.06	14.7	5.8	<0.02
36377	SS 4 RIPARIAN		8.50	3.13	0.33	2.17	0.20		0.05	6.4	5.1	<0.02
36378	SS 5 RIPARIAN		11.1	2.75	0.12	2.89	0.55	1.66	0.07	16.1	4.1	<0.02
36379	SS 6 RIPARIAN		9.62	2.70	0.22	2.12	0.55	1.46	0.04	10.3	4.1	<0.02
36380	SS 1 BENCH		28.4	0.87	0.18	2.55	0.20	1.19	0.15	17.9	11.0	<0.02
36381	SS 2 BENCH		32.4	0.74	0.14	2.46	0.80	1.09	0.16	20.6	12.8	<0.02

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Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble,ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Environmental Industrial Services
Munsell Color

Lab No.	Location	Color
36374	SS1 Riparian	10 YR 5/3 Brown
36375	SS2	10YR 5/4 Yellowish brown
36376	SS3	2.5Y 6/3 Light yellowish brown
36377	SS4	2.5Y 5.5/3 Light olive brown
36378	SS5	2.5Y 5/3 Light olive brown
36379	SS6	2.5Y 5/3 Light olive brown
36380	SS1 Bench	10YR 3/2 Very dark grayish brown
36381	SS2	10YR 4/2 Dark grayish brown

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ATTACHMENT 3

CULTURAL RESOURCE INVENTORY PREPARED BY SENCO-PHENIX

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SENCO—PHENIX

AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE PROPOSED GENWAL MINE EXPANSION

EMERY COUNTY, UTAH

PERFORMED FOR
Genwal Coal/Through
E.I.S.

In Accordance with State Guidelines
Antiquities Permit #U94-SC-424p

August 23, 1994

John A. Senulis

Direct Charge of Fieldwork

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UTAH SHPO
COVER SHEET

Project Name: GENWAL MINE EXPANSION ~~State Prj.#: U94SC424P~~
Report Date: August 23, 1994

Principal Investigator: John A. Senulis John A. Senulis

Field Supervisor(s): same

Acreage Surveyed
Intensive: 10 acres Recon/Intuitive: 10 acres

U.S.G.S. 7.5' Quad Map: Rilda Canyon, Utah (1979)

Sites Reported	Number	Smithsonian Site Number(s)
Archeological Sites:		
Revisit (No IMACS update)	0	
Revisit (IMACS update attached)	0	
New Sites (IMACS attached)	0	
Archeological Site total	0	
Historic Structues (USHS site form attached)		
Total NRHP Eligible Sites	0	

Checklist of Required Items:

1. X 1 Copy of the Final Report
2. X Copy of USGS 7.5' map showing Surveyed/Excavated area
3. Completed IMACS Site Inventory Forms Including
   - Parts A and B or C
   - NA IMACS Encoding Form
   - Site Sketch Map
   - Photographs
   - Copy of USGS 7.5' Quad showing site location with Smithsonian Site Number
4. X Completed Cover Sheet

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ABSTRACT

An intensive cultural resource survey was performed by SENCO-PHENIX on the proposed Genwal Mine expansion project for Genwal Coal through E.I.S.. The proposed project is located on private land within the boundaries of the Manti-Lasal National Forest. The purpose of the archeological survey was to determine whether cultural resources are present which may be impacted by the proposed project.

No cultural resources were located and archeological clearance for the proposed project is recommended.

PROJECT LOCATION

The project area consists of a 1,000′ long corridor centered on Crandall Creek and the extremely steep hillside to the south. The project area is in the north 1/2 of the NW/SW 1/4 of Section 5, T16S, R7E. Access to the project area is within the existing mine site. The project area is located on the enclosed copy of U.S.G.S. 7.5′ Quad: Rilda Canyon, Utah (1979) . The project area was not staked but was easily located in reference to the existing Genwal Mine.

SPECIFIC ENVIRONMENT

The project area falls within the rugged dissected uplands of the Wasatch Plateau, which in turn is part of the larger basin and range Colorado Plateau transition area. The uplands are deeply dissected by intermittent streams and spring fed Crandall Creek which flows easterly 1 and 1/2 miles into the Huntington Creek drainage.

The project area is along the narrow valley bottom of Crandall Creek. Crandall Creek has been modified in the past by fire and reclamation activities and more recently by Beaver dams. The project area is located at an elevation of 7,740′ to 7,800′ in the area of stream bed and benches. The steep hillslope at the south edge of the project area reaches 8,000′. Soils are primarily rocky colluviums mixed with tan silty loams. Vegetation in the project area consists of dense fir and pine forest mixed with Aspen groves, Mountain Mahogany and a thick shrub understory. Fauna for the area includes elk, deer, antelope, rabbits and other burrowing animals with birds and reptiles completing the scenario. A school of an unknown species of Trout was observed in Crandall Creek on the day of the survey.

PREVIOUS RESEARCH

A files search was conducted on August 18, 1994 at the Antiquities Section of the Utah State Historic Preservation Office by John Senulis of SENCO-PHENIX. The following archeological

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projects have been performed in the vicinity of the survey area:

1. 1975, David Gillio of the Manti-LaSal Forest surveyed the existing road through Crandall Canyon for the development of a mine. He located a large rockshelter (42EM-722) in the NW/SE/NE of Section 5, T16S, R7E. The rockshelter is far enough removed from the road that archeological clearance was recommended.

2. 1980, Wayne Howell of UTARC surveyed approximately 100 acres including a 200' road corridor and the SW/NW 1/4 of Section 5 and the SE/NE 1/4 of Section 6, both T16S, R7E. Howell found three prehistoric isolates in the general area around 42EM-722. Archeological clearance was recommended with the stipulation that 42EM-722 be fenced for protection prior to construction.

3. 1984, John and Jeanne Senulis of SENCO-PHENIX performed a 10% sample block survey for Genwal Coal through E.I.S of the NW/NW Section 5 and the NE/NE of Section 6, both T16S, R7E. No cultural resources were located.

No previously recorded archeological sites were located in the project area.

METHODOLOGY

The project area was archeologically surveyed by John Senulis of SENCO-PHENIX on August 22, 1994. The survey area was centered on the area of the banks of Crandall Creek and adjacent benches where meandering transects no greater than 15 meters were employed. The steep hillsides with no ground visibility to the south of Crandall Creek were not surveyed.

Special attention was paid during the survey to areas of subsurface soil exposure from animal burrowing and erosion.

Survey conditions were good with sunny skies and temperatures in the mid 80's. Winds were light out of the west at less than 5 m.p.h. Soils on the day of the survey ranged from wet and muddy on the creek banks to dry elsewhere.

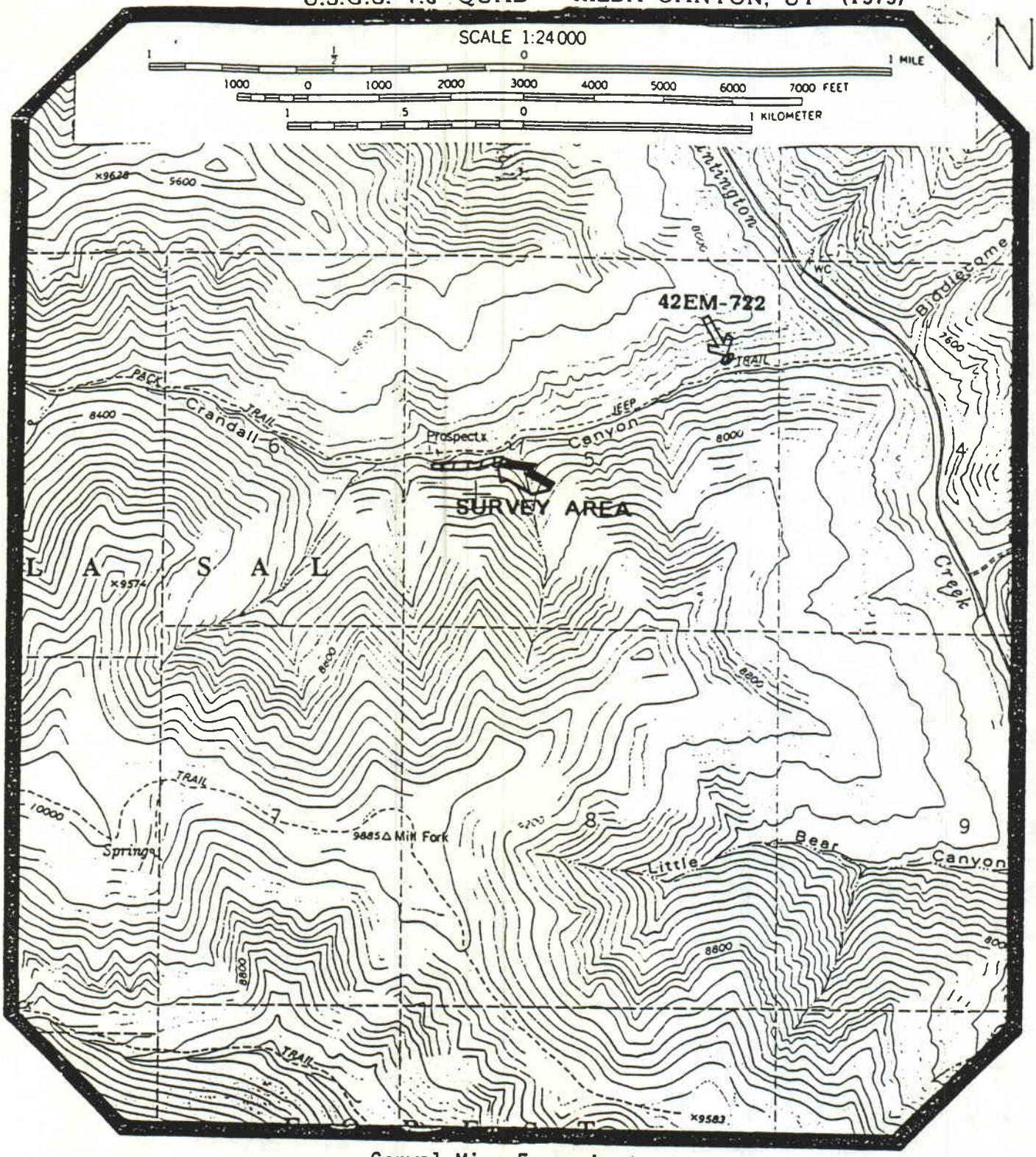
All field notes and photograph negatives are on file at the offices of SENCO-PHENIX in Salt Lake City, Utah.

FINDINGS AND RECOMMENDATIONS

No cultural resources were located and archeological clearance for the proposed mine expansion is recommended.

These recommendations are subject to approval or modification by the Utah State Historic Preservation Officer.

U.S.G.S. 7.5' QUAD RILDA CANYON, UT (1979)



Genwal Mine Expansion
Genwal Coal through E.I.S.
Emery County, Utah
Price Ranger District
Sections 5, 6 T16S, R7E
SENCO-PHENIX (UT-159)
August, 1994

INCORPORATED
EFFECTIVE:
JUL 30 1997
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UTAH DIVISION OIL, GAS AND MINING

SENCO—PHENIX

INCORPORATED
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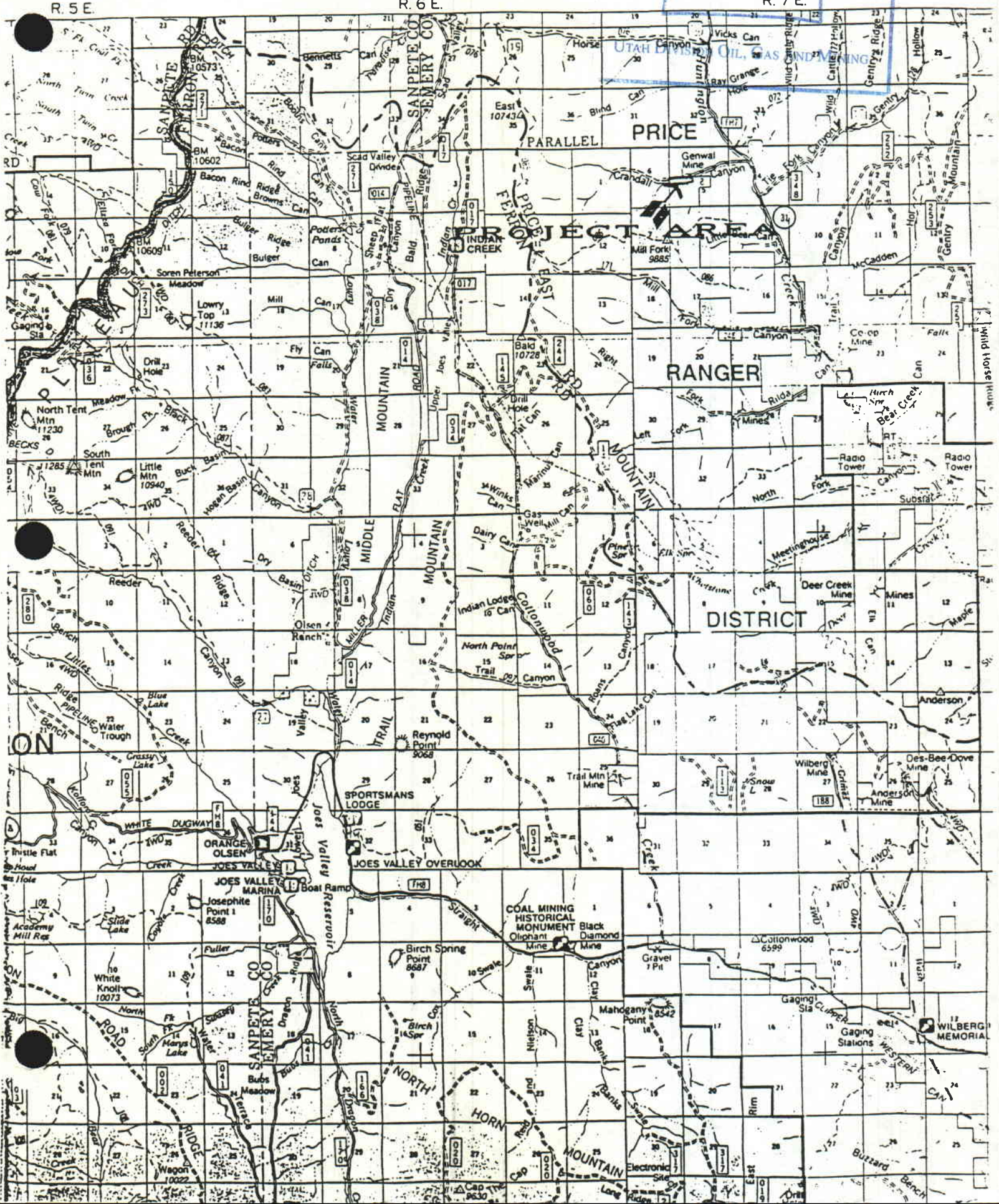
22'30" 111°15'00" 111°07'30"

(SANPETE AND FERRON RANGER DISTRICTS)



GENWAL MINE EXPANSION

INCORPORATED
EFFECTIVE:
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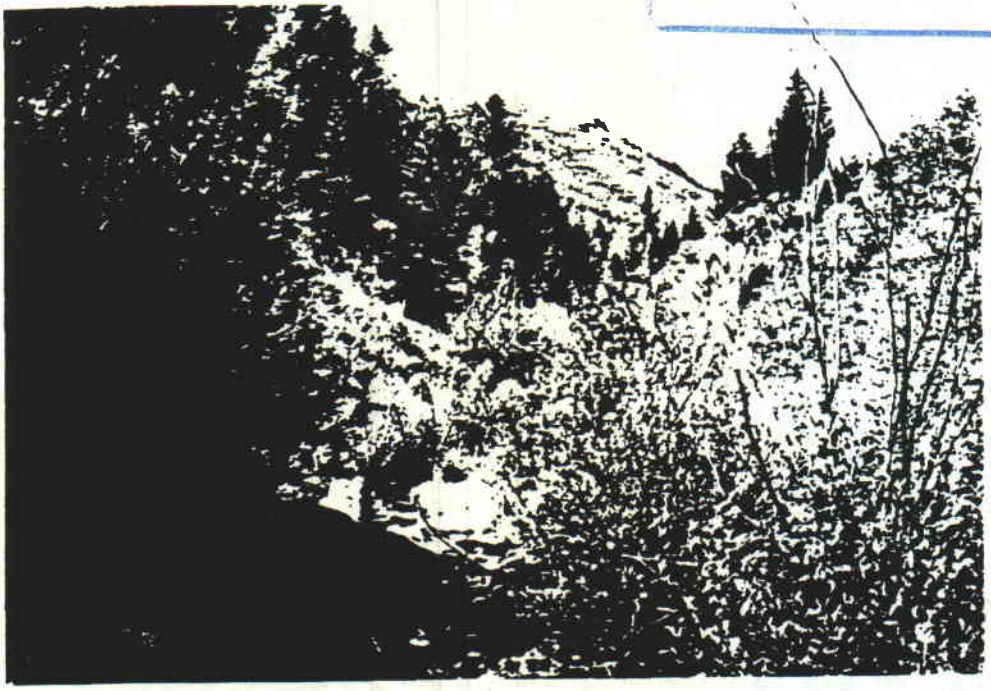
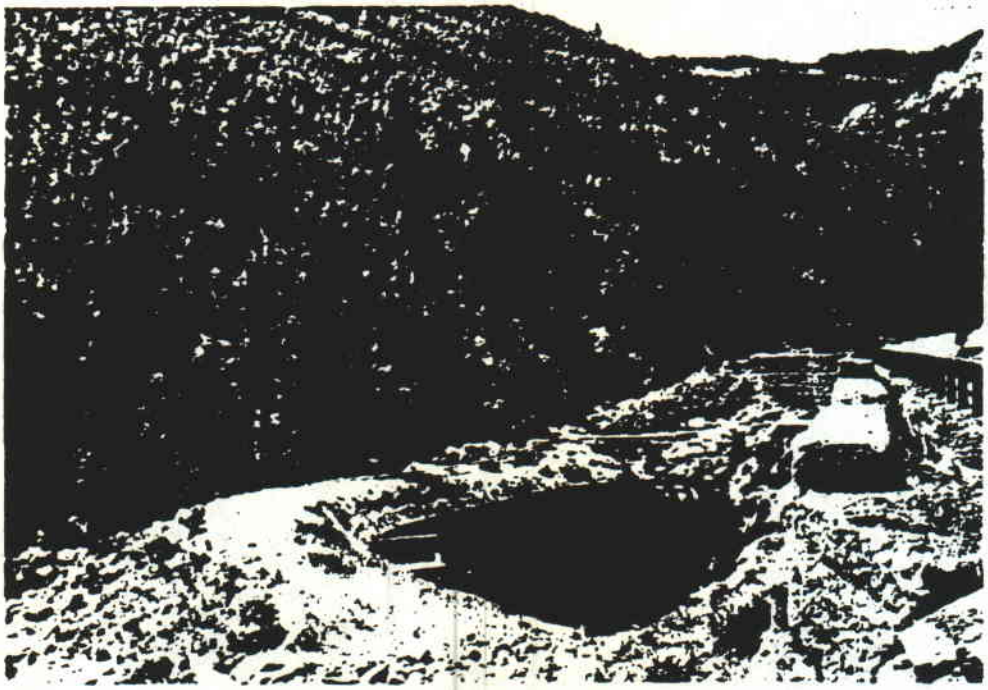


VIEW WEST OVER CRANDALL CREEK



VIEW WEST FROM EASTERN EDGE OF PROJECT AREA

GENWAL MINE EXPANSION

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VIEW SOUTHWEST OVER BEAVER PONDS

VIEW EAST OF PROJECT AREA FROM WEST END

INCORPORATED
EFFECTIVE:
JUL 30 1997
97B
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ATTACHMENT 4

VEGETATION INVENTORY DATA

LIST OF PLANT SPECIES INVENTORIED WITHIN THE RIPARIAN CORRIDOR

Plant Type	Common Name	Species	Code	Points
Grasses				
	Smooth Brome	Bromus inermis	BRIN	3
	Red Top	Agrostis alba	AGAL	88
	Downy Brome	Bromus tectorum	BRTE	112
	Cheat	Bromus secalinus	BRSE	5
	Slender Wheatgrass	Agropyron trachycaulum	AGTR	7
	Crested Wheatgrass	Agropyron christatum	AGCH	9
	wheatgrass	Agropyron spp(1)	Agrop(1)	2
	wheatgrass	Agropyron spp(2)	Agrop(2)	3
	Indian Ricegrass	Oryzopsis hymenoides	ORHY	4
	Quackgrass	Elytrigia repens	ELRE	3
	Rush	Junous spp	Junou	3
Forbs				
	Sticky Aster	Machaeranthera bigelovii	MABI	76
	Richardson's Geranium	Geranium richardsonii	GERI	61
	Sticky Geranium	Geranium viscosissimum	GEVI	36
	Western Yarrow	Achillea lanulosa	ACLA	4
	Field Horsetail	Equisetum arvense	EQAR	79
	Fireweed	Epilobium angustifolium	EPAN	14
	goldenrod	Solidago spp	Solid	32
	Seep Spring Monkeyflower	Mimulus guttatus	MIGU	4
	mustard	Brassica spp	Brass	1
	sagewort	Artemisia spp	Artem	17
	thistle	Cirisium spp	Ciris	32
	Hound's Tongue	Cynoglossum officinale	CYOF	11
	Western Aster	Aster occidentalis	ASOC	1
	moss	Moss spp	Moss	33
Shrubs				
	Hackberry	Celtis reticulata	CERE	2
	willow	Salix spp	Salix	159
	Western Red Raspberry	Rubus strigosis	RUST	14
	Woods Rose	Rosa woodsii	ROWO	55
	Nootka Rose	Rosa nutkana	RONU	36
	Common Snowberry	Symphoricarpos albus	SYAL	31
	Russet Buffaloberry	Shepherdia canadensis	SHCA	9

INCORPORATED
EFFECTIVE:
JUL 30 1997
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LIST OF PLANT SPECIES INVENTORIED WITHIN THE RIPARIAN CORRIDOR (CONTINUED)

Plant Type	Common Name	Species	Code	Points
Shrubs				
	Gray Rabbitbrush	Chrysothamnus nauseosus	CHNA	12
	bitterbrush	Purshia spp.	Pursh	41
	Current	Sativum syme	SASY	13
Trees				
	Red Oiser Dogwood	Cornus stolonifera	COST	373
	Blue Spruce	Picea pungens	PIPU	83
	Narrowleaf Cottonwood	Populus angustifolia	POAN	17
	Quacking Aspen	Populus tremuloides	POTR	62
	Chokecherry	Prunus virginiana	PRVI	80
	Douglas Fir	Pseudotsuga taxifolia	PSTA	3

LIST OF PLANT SPECIES INVENTORIED ON RIPARIAN BENCH

Plant type	Common Name	Species	Code	Points
Grasses				
	Wheatgrass	Agropyron spp (1)	Agrop	5
	Red Top	Agrostis alba	AGAL	2
	Crested Wheatgrass	Agropyron christatum	AGCH	10
	Smooth Brome	Bromus inermis	BRIN	3
	Cheat	Bromus secalinus	BRSE	75
	Downey Brome	Bromus tectorum	BRTE	10
	Indian Ricegrass	Oryzopsis hymenoides	ORHY	1
Forbs				
	Strawberry	Americana britt	AMBR	3
	Western Yarrow	Achillea lanulosa	ACLA	15
	sagewort	Artemisia spp	Artem	2
	Indian Paintbrush	Castilleja Mutis	CAMU	3
	Thistle	Cirisium spp	Ciris	8
	Fireweed	Epilobium angustifolium	EPAN	8
	Richardson's Geranium	Geranium richardsonii	GERI	1
	Sticky Aster	Machaeranthera bigelovii	MABI	37
	Goldenrod	Solidago spp	Solid	25
	mullein	Verbascum spp	Verba	7

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LIST OF PLANT SPECIES INVENTORIED ON RIPARIAN BENCH (CONTINUED)

Plant type	Common Name	Species	Code	Points
Shrubs				
	Gray Rabbitbrush	Chrysothamnus nauseosus	CHNA	157
	Woods Rose	Rosa woodsii	ROWO	55
	Western Red Raspberry	Rubus strigosis	RUST	8
	Current	Sativum syme	SASY	148
	Russet Buffaloberry	Shepherdia canadensis	SCHA	10
	Common Snowberry	Symphoricarpos albus	SYAL	243
Trees				
	Rocky Mountain Maple	Acer glabrum	ACGL	19
	Red Oiser Dogwood	Cornus stolonifera	COST	2
	Common Juniper	Juniperus commonis	JUCO	88
	Blue Spruce	Picea pungens	PIPU	156
	Narrowleaf Cottonwood	Populus angustifolia	POAN	9
	Quacking Aspen	Populus tremuloides	POTR	502
	Blue Elder	Sambucus cerulea	SACE	20

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

QUANTITATIVE ANALYSIS OF RIPARIAN CORRIDOR

COVER	SPECIES	ABUNDANCE (n)	RELATIVE ABUNDANCE (p)	DIVERSITY (H')
Grasses				
	BRIN	3	0.013	-0.024
	AGAL	88	0.368	-0.160
	BRTE	112	0.469	-0.154
	BRSE	5	0.021	-0.035
	AGTR	7	0.029	-0.045
	AGCH	9	0.038	-0.054
	AGROP 1	2	0.008	-0.017
	AGROP 2	3	0.013	-0.025
	ORHY	4	0.017	-0.030
	ELRE	3	0.013	-0.025
	JUNOU	3	0.013	-0.025
	S=11	**N=239**	**1.000**	**H'=0.594**
Forbs				
	MABI	76	0.192	-0.138
	GERI	61	0.154	-0.125
	GEVI	36	0.091	-0.095
	ACLA	4	0.010	-0.020
	EQAR	79	0.200	-0.140
	EPAN	14	0.035	-0.051
	SOLID	32	0.081	-0.088
	MIGU	4	0.010	-0.020
	BRASS	1	0.003	-0.008
	ARTEM	11	0.028	-0.043
	CIRIS	32	0.081	-0.088
	CYOF	11	0.028	-0.043
	ASOC	1	0.003	-0.008
	MOSS	33	0.084	-0.090
	S=14	**N=395**	**1.000**	**H'=0.957**

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

QUANTITATIVE ANALYSIS OF RIPARIAN CORRIDOR (CONTINUED)

COVER	SPECIES	ABUNDANCE (n)	RELATIVE ABUNDANCE (p)	DIVERSITY (H')
Shrubs				
	CERE	2	0.002	-0.005
	SALIX	159	0.183	-0.135
	RUST	11	0.013	-0.025
	ROWO	553	0.638	-0.125
	RONU	36	0.042	-0.058
	SYAL	31	0.036	-0.052
	SHCA	9	0.010	-0.020
	CHNA	12	0.014	-0.026
	SASY	13	0.015	-0.027
	PURSH	41	0.047	-0.062
	S=10	**N=867**	**1.000**	**H'=0.535**
Trees				
	COST	373	0.604	-0.132
	PIPU	83	0.134	-0.117
	POAN	17	0.028	-0.043
	POTR	62	0.100	-0.100
	PRVI	80	0.129	-0.115
	PSTA	3	0.005	-0.012
	S=6	**N=618**	**1.000**	**H'=0.519**

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

QUANTITATIVE ANALYSIS OF BENCH VEGETATION

COVER	SPECIES	ABUNDANCE (n)	RELATIVE ABUNDANCE (p)	DIVERSITY (H')
Grasses				
	AGROP 1	5	0.047	-0.062
	AGAL	2	0.019	-0.033
	AGCH	10	0.094	-0.097
	BRIN	3	0.028	-0.043
	BRSE	75	0.709	-0.106
	BRTE	10	0.094	-0.097
	ORHY	1	0.009	-0.018
	S=7	**N=106**	**1.000**	**H'=0.456**
Forbs				
	AMBR	3	0.028	-0.043
	ACLA	15	0.138	-0.119
	ARTEM	2	0.018	-0.031
	CAMU	3	0.028	-0.043
	CIRIS	8	0.073	-0.083
	EPAN	8	0.073	-0.083
	GERI	1	0.009	-0.018
	MABI	37	0.339	-0.159
	SOLID	25	0.229	-0.147
	VERBA	7	0.064	-0.076
	S=7	**N=109**	**1.000**	**H'=0.802**
Shrubs				
	CHNA	157	0.253	-0.151
	ROWO	55	0.089	-0.094
	RUST	8	0.013	-0.025
	SASY	148	0.238	-0.148
	SCHA	10	0.016	-0.029
	SYAL	243	0.391	-0.159
	S=6	**N=621**	**1.000**	**H'=0.606**

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

QUANTITATIVE ANALYSIS OF BENCH VEGETATION (CONTINUED)

COVER	SPECIES	ABUNDANCE (n)	RELATIVE ABUNDANCE (p)	DIVERSITY (H')
Trees				
	ACGL	19	0.024	-0.039
	COST	2	0.003	-0.008
	JUCO	88	0.111	-0.106
	PIPU	156	0.196	-0.139
	POAN	9	0.011	-0.026
	POTR	502	0.631	-0.126
	SACE	20	0.025	-0.040
	S=7	**N=796**	**1.000**	**H'=0.484**

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

INCORPORATED
EFFECTIVE:
JUL 30 1997
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ATTACHMENT 5

1993 UDWR RAPTOR SURVEY OF CRANDALL CANYON AREA

RESOURCES
Wildlife Resources

INCORPORATED
EFFECTIVE:
JUL 30 1997
97B
UTAH DIVISION OIL, GAS AND MINING

memorandum

June 29, 1993

TO: Bill Bates, Native Wildlife Manager

FROM: Scott Richardson, Habitat Biologist

SUBJECT: Genwal Mine Permit Area Raptor Survey

On June 29, 1993, I accompanied Mel Coonrod, consultant for Genwal Coal Co., on a raptor survey of Genwal's mine permit area. In addition, we surveyed the Left Fork of Huntington Canyon. Rocky Mountain Helicopter was hired by Genwal to conduct the survey. The following is a summary of the results of this survey. The numbers correspond to nest sites marked on the attached map. A similar summary was sent to Mel Coonrod and Genwal. Also attached is a map of the Left Fork of Huntington Canyon. Comments are written directly on the map as it was not included in the summary sent to Genwal.

Nest #1 - This site was indicated on our overlay. We were not able to locate the nest.

Nest #2 - This site was indicated on our overlay. We were not able to locate the nest.

Nest #3 - This is a new site that was not indicated on our overlays. It was old and in bad repair.

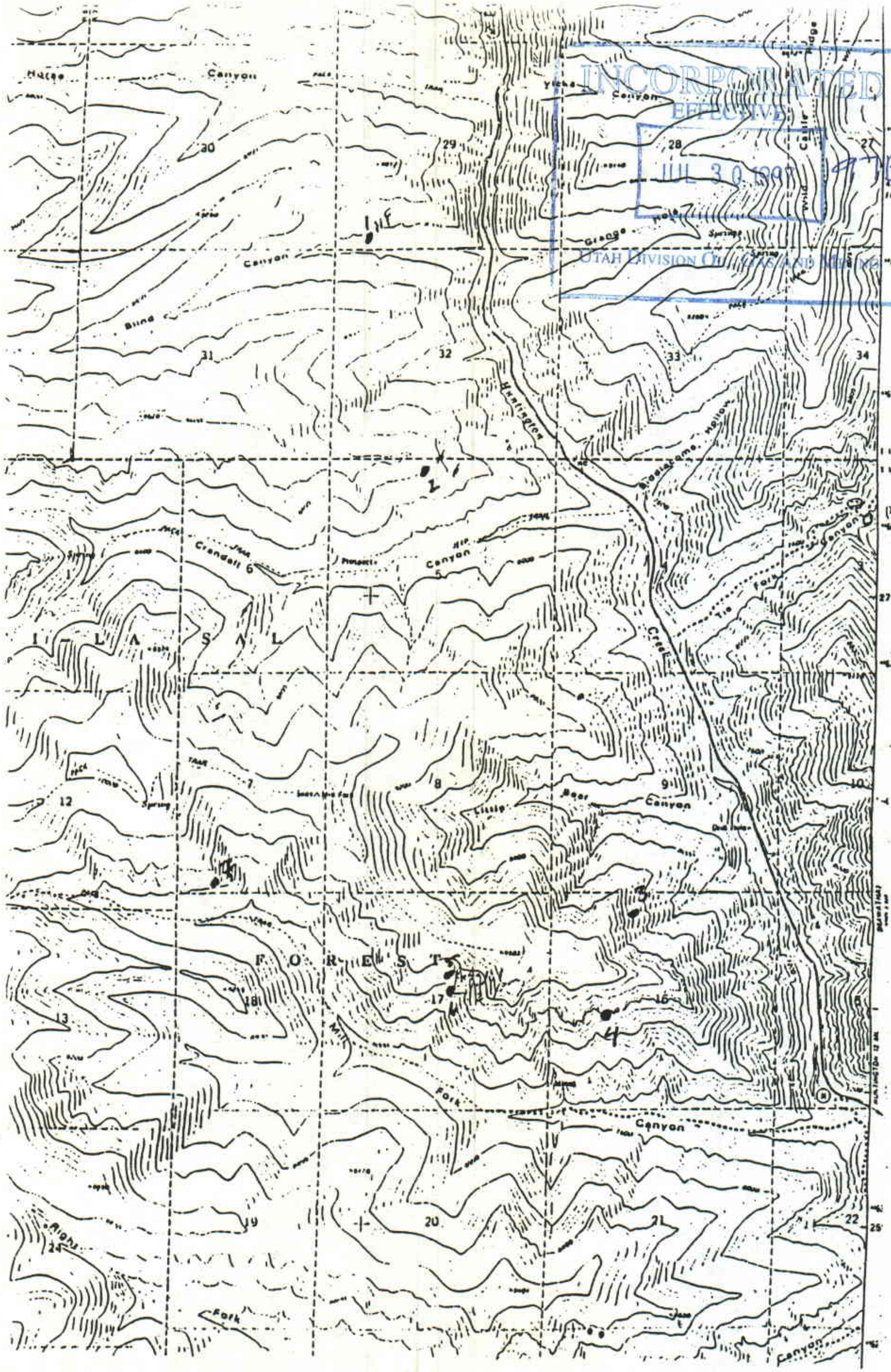
Nest #4 - This site was indicated on our overlay. We were not able to locate the nest.

Nest #5 - This was indicated as a golden eagle nest on our overlay. It was active, but was being used by red-tails. There were two young nearly ready to fledge. One adult was at the nest and hovered nearby the entire time we were in the area.

Nest #6 - This site was indicated on our overlay. We were not able to locate the nest.

Nest #7 - This site was indicated on our overlay. We were not able to locate the nest.

We observed a golden eagle near the nest in the Left Fork, an immature red-tail in Crandall Canyon and an adult red-tail in Little Bear Canyon in addition to the red-tails at the nest site.



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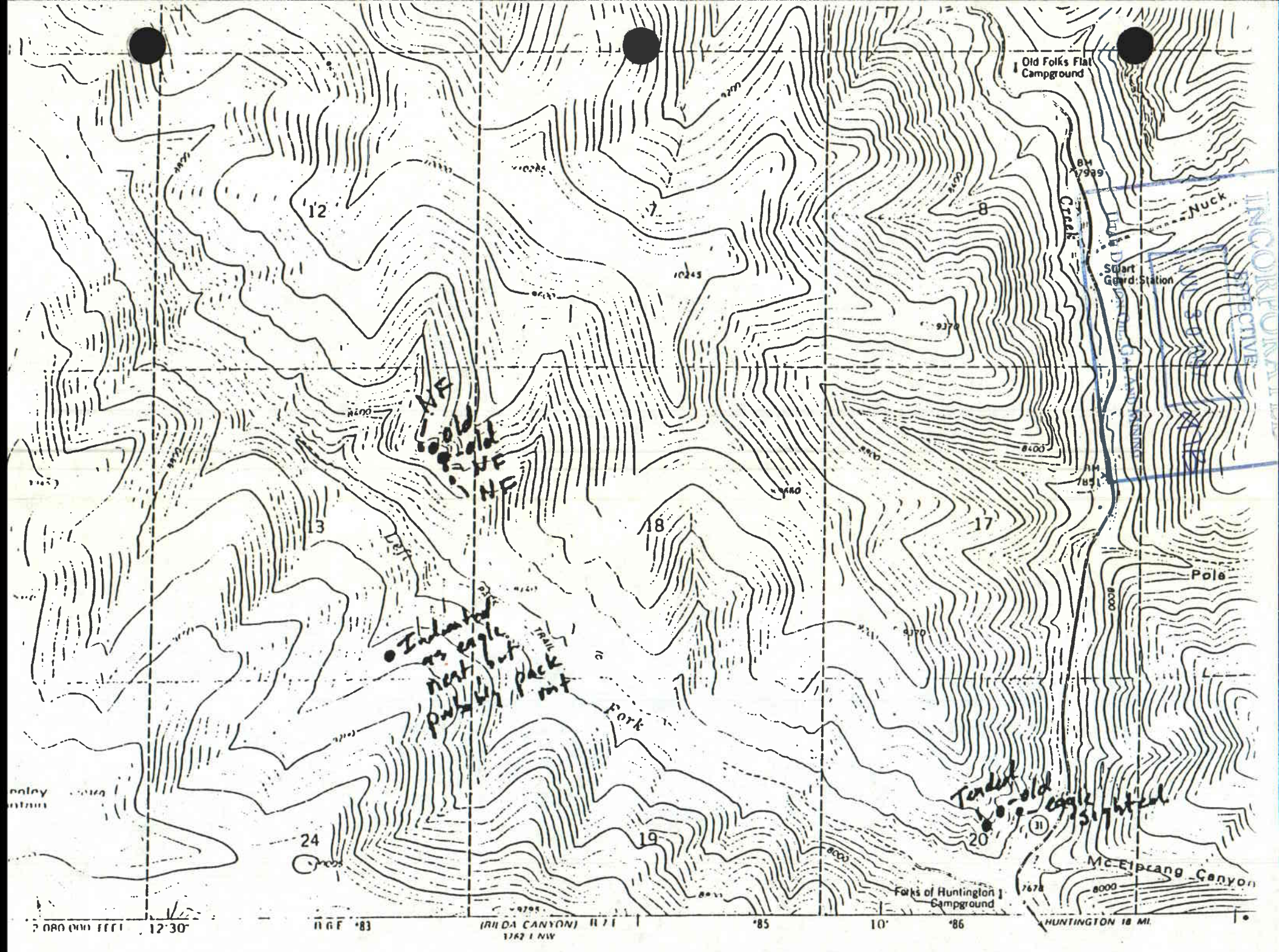
JUL 30 1997
UTAH DIVISION OF OIL, GAS AND MINING

- Survey Boundary

• - Nest sites



Old Folks Flat Campground
Nuck
Creek
Stuart Guard Station
Pole
Mc Elprang Canyon
Forks of Huntington Campground
Fork
TRAIL
12
7
8
13
18
17
24
19
20
31
NF
old
old
NF
NF
Indicated as eagle nest but probably pack rat
Tended
old
eagle sighted
2 080 000 FEET
12'30"
R 6 E
'83
(BILDA CANYON)
R 7 E
'85
10'
'86
HUNTINGTON 18 MI.
SCALE 1:24 000

INCORPORATED
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ATTACHMENT 6

LIST OF BIRDS SIGHTED WITHIN PROPOSED AREA OF DISTURBANCE
JULY TO OCTOBER 1994

BIRDS IDENTIFIED WITHIN AREA OF POTENTIAL DISTURBANCE (RIPARIAN AREA AND ADJACENT BENCH)

DATE	COMMON NAME	SPECIES	SEX	NUMBER
July 11	Broad-tailed Hummingbird	Selasphorus platycercus	F	2
	Western Flycatcher	Empidonax Complex	M	1
	American Dipper	Cinclus mexicanus	U	2
July 12	Evening Grosbeak	Coccothraustes vespertinus	M	1
	Common Raven	Corvus corax	U	2
	Northern Flicker	Colaptes auratus	M	1
July 20	Broad-tailed Hummingbird	Selasphorus platycercus	F	1
	Red-Brested Nuthatch	Sitta canadensis	M	2
	Violet-green Swallow	Tachycineta thalassina	M&F	>25
	Western Tanager	Piranga ludoviciana	M	1
July 21	American Dipper	Cinclus mexicanus	M	3
	American Robin	Turdus migratorius	M&F	5
	Rufous Hummingbird	Selasphorus rufus	M	1
	Broad-tailed Hummingbird	Selsaphorus platycercus	M	2
August 18	Broad-tailed Hummingbird	Selsaphorus platycercus	M	2
	American Dipper	Cinclus mexicanus	U	2
	Western Flycatcher	Empidonax Complex	M	1
September 14	American Dipper	Cinclus mexicanus	U	1
	Red-Brested Nuthatch	Sitta canadensis	M	1
	Common Raven	Corvus corax	U	1
	Downy Woodpecker	Picoides pubescens	M	1
October 7	American Dipper	Cinclus mexicanus	U	1
	Northern Flicker	Colaptes auratus	M	2
	Common Raven	Corvus corax	M	1
	Black-capped Chickadee	Parus atricapillus	M&F	5

INCORPORATED
EFFECTIVE:
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INCORPORATED
EFFECTIVE:
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ATTACHMENT 7

MACROBENTHIC COMMUNITY DATA

TABLE 1. FAST WATER: RIPPLE (CPOM) SAMPLES

SAMPLE	FUNCTIONAL GROUP	ORDER	FAMILY	(n)
Sample 2	Predators			
		Diptera	Tipula	3
	Collectors			
	Filtering	Trichoptera	Hydropsychidae	1
	Gathering	Diptera	Chrionomidae	1
	Scrapers			
		Ephemeroptera	Heptageniidae	4
	Shredders			
		Trichoptera	Limnephilidae	4
				n=13
Sample 5	Predators			
		Diptera	Tipula	1
	Collectors			
	Gathering	Coleoptera	Elmidae	1
	Scrapers			0
	Shredders			
		Trichoptera	Limniphelidae	3
				n=5
Sample 11	Predators			
		Plecoptera	Setipalpia	2
	Collectors			
	Gathering	Diptera	Chironomidae	8
		Coleoptera	Elmidae	6
		Trichoptera	Leptoceridae	2
	Scrapers			
		Coleoptera	Psephenidae	5
	Shredders			0
				n=23

TOTAL n = 41

INCORPORATED
EFFECTIVE:
JUL 30 1997
UTAH DIVISION OIL, GAS AND MINING

TABLE 2 FAST WATER: RAPID (PERIPHYTON) SAMPLES

SAMPLE	FUNCTIONAL GROUP	ORDER	FAMILY	(n)
Sample 3				
	Predators			0
	Collectors			
	Filtering	Trichoptera	Hydropsychidae	4
	Scrapers			
		Ephemeroptera	Heptageniidae	2
	Shredders			
		Diptera	Tipulidae	1
				n=7
Sample 7				
	Predators			
		Hymenoptera		3
	Collectors			
	Gathering	Coleptera	Elmidae	3
	Scrapers			
		Ephemeroptera	Heptageniidae	3
		Gastropoda		9
	Shredders			
		Diptera	Tipulidae	2
				n=20
Sample 9				
	Predators			
		Diptera	Tipula	3
		Plecoptera	Setipalpia	1
	Collectors			
	Filtering	Trichoptera	Hydropsychidae	4
	Gathering	Coleoptera	Elmidae	14
		Diptera	Chironomidae	5
	Scrapers			
		Coleoptera	Psephenidae	12
		Ephemeroptera	Heptageniidae	2
		Gastropoda		2
	Shredders			0
				n=43

TOTAL n = 70

INCORPORATED
EFFECTIVE:
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TABLE 3 SLOW WATER: POOL (FPOM) SAMPLES

SAMPLE	FUNCTIONAL GROUP	ORDER	FAMILY	(n)
Sample 1				
	Predators			0
	Collectors			0
	Scrapers			0
	Shredders			
		Trichoptera	Limnephilidae	3
				n=3
Sample 8				
	Predators			0
	Collectors			
	Gathering	Coleoptera	Elmidae	4
		Trichoptera	Leptoceridae	9
	Scrapers			
		Ephemeroptera	Heptageniidae	3
		Gastropda		18
	Shredders			
		Diptera	Tipulidae	12
				n=46
Sample 10				
	Predators			
		Diptera	Tipula	4
		Plecoptera	Setipalpia	3
	Collectors			
	Gathering	Coleoptera	Elmidae	11
		Diptera	Chironomidae	10
	Scrapers			
		Ephemeroptera	Heptageniidae	5
		Gastropoda		24
	Shredders			0
				n=57

TOTAL n = 106

INCORPORATED
EFFECTIVE:
JUL 30 1997
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TABLE 4 SLOW WATER: POND (WOOD AND FPOM) SAMPLES

SAMPLE	FUNCTIONAL GROUP	ORDER	FAMILY	(n)
Sample 4				
	Predators			
		Diptera	Tipula	6
	Collectors			
	Gathering	Diptera	Chironomidae	5
		Coleoptera	Elmidae	3
	Scrapers			
		Gastropoda		4
	Shredders			
		Trichoptera	Limnephilidae	5
		Diptera	Tipulidae	10
				n=33
Sample 6				
	Predators			
		Diptera	Tipula	6
	Collectors			
	Gathering	Diptera	Chrionomidae	15
		Coleoptera	Elmidae	1
	Scrapers			
		Gastropoda		6
	Shredders			
		Trichoptera	Limnephilidae	4
				n=32
Sample 12				
	Predators			
		Diptera	Tipula	8
	Collectors			
	Gathering	Diptera	Chironomidae	4
		Trichoptera	Ephemeridae	1
		Tubifix		25+
	Scrapers			
		Gastropoda		9
	Shredders			0
				n=47+

TOTAL n = 112+

INCORPORATED
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INCORPORATED
EFFECTIVE:
JUL 30 1997
97B
UTAH DIVISION OIL, GAS AND MINING

ATTACHMENT 8

UDWR FISHERIES DATA

INCORPORATED
EFFECTIVE:
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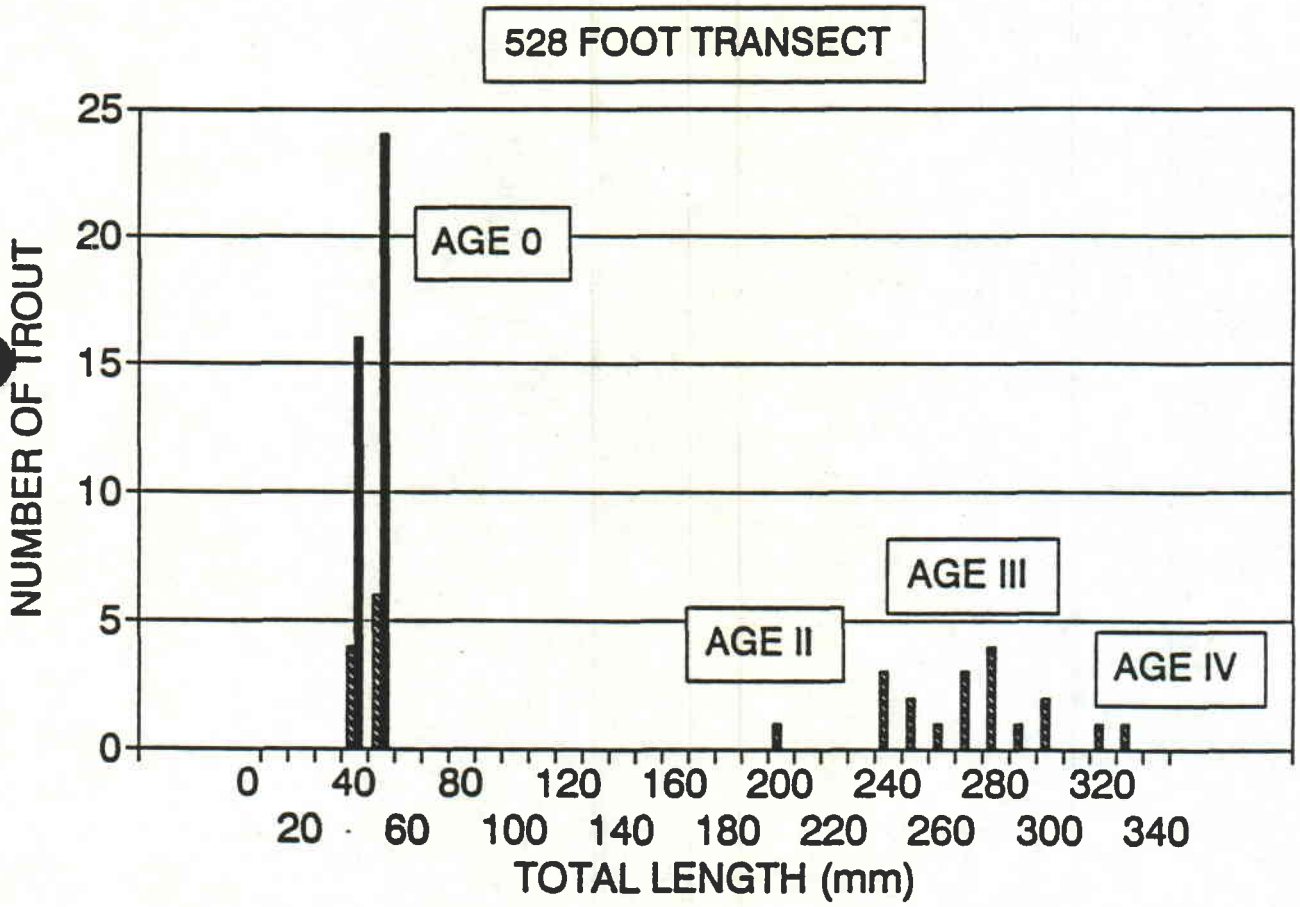
CRANDALL CANYON CREEK

AUGUST 18, 1994/NEXT TO MINE



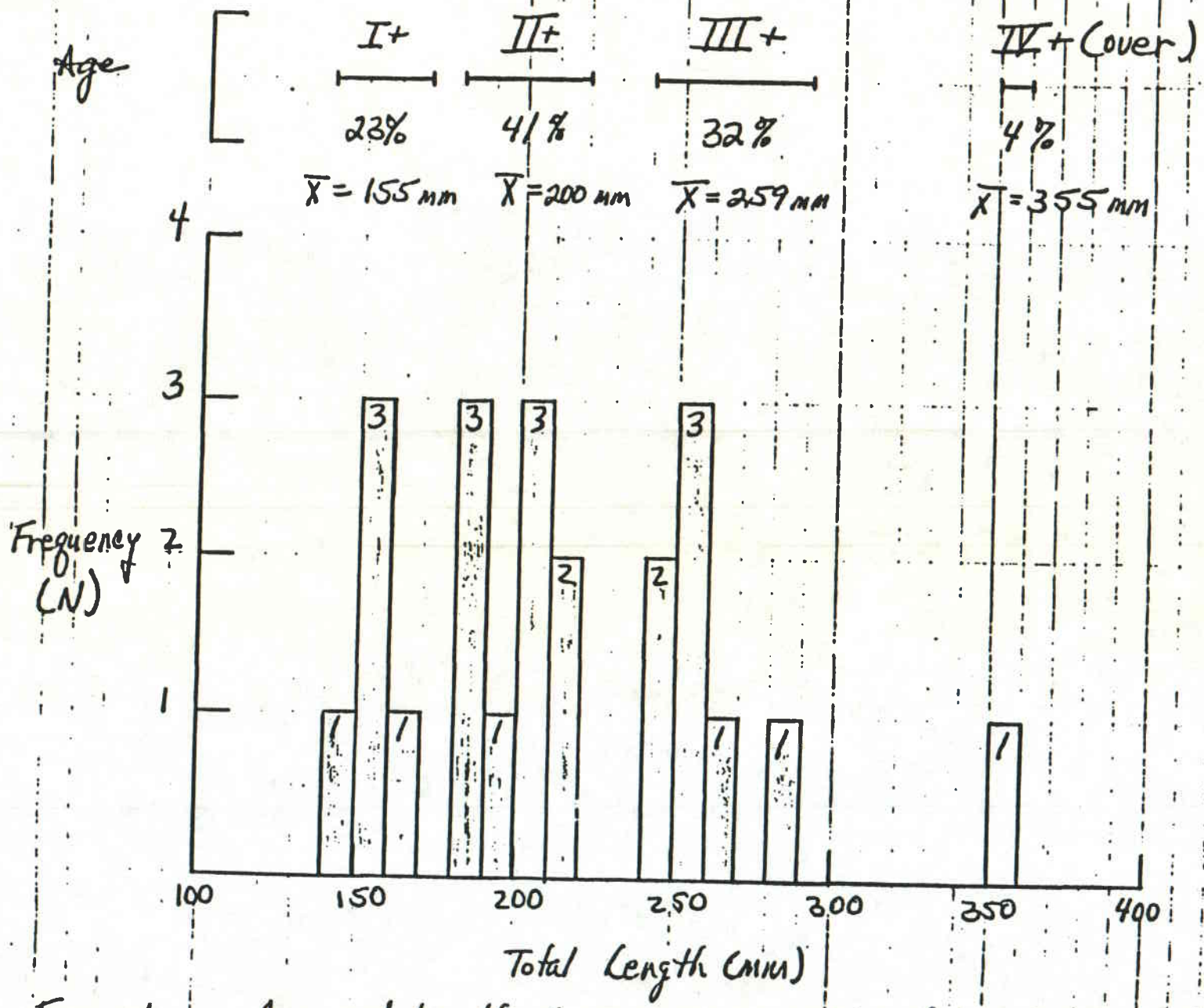


Figure 1. Age and length frequency of cutthroat trout sampled in Crandall Canyon Creek, Utah on July 21, 1983.

INCORPORATED
EFFECTIVE:
JUL 30 1997
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INCORPORATED
EFFECTIVE:
JUL 30 1997
97B
UTAH DIVISION OIL, GAS AND MINING

ATTACHMENT 9

VEGETATION COMPOSITION OF TRANSECTS WITHIN RIPARIAN CORRIDOR

VEGETATION COMPOSITION OF TRANSECTS WITHIN RIPARIAN CORRIDOR

Transect 1A 80 points

Bare	11
Litter	11
Rock	4
MABI	6
BRIN	1
GERI	2
COST	3
ACLA	1
PIPU	20
AGAL	1
Salix spp	20

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Transect 1B 60 points

Bare	1
Litter	18
Rock	1
PIPU	15
MABI	3
COST	11
POAN	2
EQAR	2
GERI	2
CERE	2
Salix spp	3

Transect 1C 60 points

Bare	6
Litter	22
Rock	3
COST	20
EQAR	2
AGAL	5
GERI	2

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Transect 1D 60 points

Bare	3
Litter	8
Rock	12
POTR	7
POAN	15
PRVI	11
GERI	2
EQAR	2

Transect 1E 60 points

Bare	0
Litter	6
Rock	1
BRTE	8
MABI	8
RUST	4
RONU	5
COST	20
EQAR	7
GERI	1

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Transect 1F 80 points

Bare	0
Litter	1
Rock	0
ROWO	10
RONU	23
POTR	10
PRVI	28
GERI	4
PIPU	2
COST	2

Transect 1G 100 points

Bare	0
Litter	4
Rock	1
COST	70
POTR	10
AGAL	2
Salix spp	10
Moss spp	3

Transect 1H 120 points

Bare	0
Litter	0
Rock	0
PRVI	40
COST	60
PIPU	20

Transect 1I 120 points

Bare	0
Litter	9
Rock	2
ROWO	20
RONU	8
SYAL	6
PSTA	2
COST	44
AGAL	7
EPAN	1
GERI	1
Salix spp	20

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Transect 1 140 points

Bare	7
Litter	40
Rock	7
BRSE	1
Agropyron spp(1)	2
ROWO	22
COST	15
PIPU	2
Artemisia spp(1)	1
Agropyron spp(2)	3
4	7
GEVI	16
Solidago spp	2
BRTE	6
Junous spp	1
AGAL	8

Transect 1J 60 points

Bare	4
Litter	7
Rock	3
ROWO	11
BRTE	4
POTR	8
COST	14
GERI	3
Artemisia spp(1)	4
Solidago spp	1
Junous spp	1

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Transect 2 200 points

Bare	26
Litter	72
Rock	17
COST	12
PIPU	3
POTR	12
ROWO	20
Cirsium spp	1
GEVI	3
Solidago spp	16
SYAL	1
Purshia spp	17

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Transect 1K 40 points

Bare	4
Litter	0
Rock	8
ROWO	16
BRTE	2
COST	4
MIGU	1
GEVI	1
Moss spp	4

Transect 3 140 points

Bare	15
Litter	31
Rocks	23
POTR	1
ROWO	3
COST	35
PIPU	2
GEVI	6
BRTE	2
RUST	2
Salix spp	20

Transect 4 120 points

Bare	5
Litter	14
Rocks	16
ROWO	56
COST	11
ACLA	2
BRSE	4
BRIN	2
MIGU	2
AGAL	3
Brassica spp	1
Salix spp	2
Artemisia spp	1
Moss spp	1

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Transect 5 100 points

Bare	14
Litter	18
Rocks	4
ROWO	45
GEVI	10
Purshia spp	4
COST	1
PSTA	1
Moss spp	3

Transect 6 100 points

Bare	0
Litter	15
Rock	5
ROWO	24
BRTE	56

Transect 7 100 points

Bare	4
Litter	17
Rock	5
ROWO	21
POTR	1
BRTE	17
GERI	6
EPAU	1
Purshia spp	9
Salix spp	6
Artemisia spp(2)	5
Junous spp	1
Moss spp	7

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Transect 8 100 points

Bare	17
Litter	12
Rock	3
ROWO	8
BRTE	17
PRVI	1
POTR	4
EQAR	13
GERI	7
PIPU	3
COST	1
Solidago spp	11
Cirisium spp	2
Moss spp	1

Transect 9 120 points

Bare	0
Litter	0
Rock	2
ROWO	45
AGAL	17
EQAR	11
COST	34
PIPU	3
Purshia spp	5
Cirisium spp	1
Salix spp	2

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Transect 10 80 points

Bare	11
Litter	28
Rock	2
ROWO	18
AGAL	8
GERI	1
MIGU	1
COST	1
ACLA	1
SASY	5
Solidago spp	2
Cirisium spp	2

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Transect 11 80 points

Bare	0
Litter	0
Rock	0
ROWO	40
AGAL	8
GERI	7
MABI	5
Salix spp	20

Transect 12 100 points

Bare	9
Litter	18
Rock	6
ROWO	17
POTR	7
GERI	7
MABI	12
AGAL	3
PIPU	13
Cirisium spp	3
Salix spp	5

Transect 13 80 points

Bare	1
Litter	5
Rock	8
ROWO	31
MABI	19
AGAL	5
EQAR	1
GERI	7
SHCA	2
Salix spp	1

Transect 14 80 points

Bare	10
Litter	17
Rock	13
ROWO	8
CYOF	11
MABI	11
AGAL	2
EQAR	7
Moss spp	1

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Transect 15 100 points

Bare	1
Litter	18
Rock	5
ROWO	39
AGAL	9
GERI	6
MABI	3
COST	1
RUST	2
Purshia spp	2
Salix spp	7
Moss spp	7

Transect 16 100 points

Bare	1
Litter	0
Rock	5
ROWO	33
AGCH	9
AGAL	5
SASY	4
Salix spp	43

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Transect 17 100 points

Bare	5
Litter	8
Rock	8
ROWO	21
CHNA	10
MABI	9
EQAR	18
AGAL	5
SASY	4
Cirisium spp	12

Transect 18 120 points

Bare	13
Litter	17
Rock	14
ROWO	20
RUST	3
EPAU	5
SYAL	21
EQAR	10
POTR	2
COST	8
SHCA	1
Purshia spp	4
Moss spp	2

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Transect 19 80 points

Bare	10
Litter	18
Rock	6
ROWO	22
ORHY	4
SYAL	1
ELRE	2
EPAU	4
EQAR	3
GERI	3
CHNA	2
Cirisium spp	5

Transect 20 60 points

Bare	15
Litter	5
Rock	5
ROWO	3
EPAU	3
SYAL	2
ELRE	1
COST	6
EQAR	3
SHCA	6
Narrowleaf Aster	1
Cirisium spp	6
Moss spp	4

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VEGETATION COMPOSITION WITHIN RIPARIAN CORRIDOR

Plant Type	Common Name	Species	Code	Points
Grasses				
	Smooth Brome	Bromus inermis	BRIN	3
	Red Top	Agrostis alba	AGAL	88
	Downy Brome	Bromus tectorum	BRTE	112
	Cheat	Bromus secalinus	BRSE	5
	Slender Wheatgrass	Agropyron trachycaulum	AGTR	7
	Crested Wheatgrass	Agropyron christatum	AGCH	9
	wheatgrass	Agropyron spp(1)	Agrop(1)	2
	wheatgrass	Agropyron spp(2)	Agrop(2)	3
	Indian Ricegrass	Oryzopsis hymenoides	ORHY	4
	Quackgrass	Elytrigia repens	ELRE	3
	Rush	Junous spp	Junou	3
Forbs				
	Sticky Aster	Machaeranthera bigelovii	MABI	76
	Richardson's Geranium	Geranium richardsonii	GERI	61
	Sticky Geranium	Geranium viscosissimum	GEVI	36
	Western Yarrow	Achillea lanulosa	ACLA	4
	Field Horsetail	Equisetum arvense	EQAR	79
	Fireweed	Epilobium angustifolium	EPAN	14
	goldenrod	Solidago spp	Solid	32
	Seep Spring Monkeyflower	Mimulus guttatus	MIGU	4
	mustard	Brassica spp	Brass	1
	sagewort	Artemisia spp	Artem	11
	thistle	Cirisium spp	Ciris	32
	Hound's Tongue	Cynoglossum officinale	CYOF	11

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Plant Type	Common Name	Species	Code	Points
	Narrowleaf aster			1
	moss	Moss spp	Moss	33
Shrubs				
	Hackberry	Celtis reticulata	CERE	2
	willow	Salix spp	Salix	159
	Western Red Raspberry	Rubus strigosis	RUST	11
	Woods Rose	Rosa woodsii	ROWO	553
	Nootka Rose	Rosa nutkana	RONU	36
	Common Snowberry	Symphoricarpos albus	SYAL	31
Shrubs				
	Russet Buffaloberry	Shepherdia canadensis	SHCA	9
	Gray Rabbitbrush	Chrysothamnus nauseosus	CHNA	12
	bitterbrush	Purshia spp.	Purshia	41
	Current	Sativum syme	SASY	13
Trees				
	Red Oiser Dogwood	Cornus stolonifera	COST	373
	Blue Spruce	Picea pungens	PIPU	83
	Narrowleaf Cottonwood	Populus angustifolia	POAN	17
	Quacking Aspen	Populus tremuloides	POTR	62
	Chokecherry	Prunus virginiana	PRVI	80
	Douglas Fir	Pseudotsuga taxifolia	PSTA	3

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