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complete discussion and baseline information for summaries presented herein may be found in Volumes 4 and A-1.

In August 2001, significant volumes of water were encountered in Mine #2 of the Skyline Mine. The new inflows caused significant difficulties in mining the Lower O'Connor B seam and resulted in the mine restudying the hydrogeology of the mine area. A great deal of new information regarding the hydrologic characteristics of the Blackhawk and Star Point Formations has been obtained and detailed discussions regarding this new information are included in the July 2002 Addendum to the PHC (first submitted in July 2002 and amended in October 2002).

2.3.1 Geologic Setting of the Ground Water System

The Skyline permit area lies in the northern end of the Wasatch Plateau, on the west edge of the Clear Creek anticline. As such, the dip of the strata is generally towards the west, varying between six percent (three degrees) and ten percent (six degrees).

With the exception of local alluvial deposits, all of the units exposed on and immediately adjacent to the project area are formations of the Cretaceous Mesaverde Group. The Star Point Sandstone is a massive, medium-grained sandstone which is approximately 1,000 feet thick with interbedding tongues of Mancos shale in the project area. A generalized stratigraphic section of the Skyline property is shown in Figure 2.2-A.

The Blackhawk Formation, which immediately overlies the Star Point Sandstone, is comprised of interbedded sandstones, shales, siltstones, and coal. The sandstones of the Blackhawk Formation are fine-to-medium- grained, and have locally high clay contents. The

shales of the Blackhawk Formation in the permit area are irregularly bedded and due to their tendency to swell when wet, they should, in most cases, form an effective barrier to vertical movement of ground water.

A sample of the claystone from the Blackhawk Formation was obtained from an in-mine hole and was analyzed and determined to contain 58 percent montmorillonite. Two drill logs were evaluated for the amount of claystone/mudstone present as a demonstration of the swelling capabilities of the formation. Drill hole 74-26-3 (SW/NW, Sec. 26, T13S, R6E) was selected due to is proximity to Burnout Canyon Creek, and Well 91-35-1 (SW/SW, Sec.35, T12S, R6E) being located in the North Lease area between Winter Quarters and Woods Canyons. In drill hole 74-26-3, mudstone was interbedded throughout the entire 1400-foot depth at a rate of 26-feet per every 100-feet of depth, or 26.3 percent. Similarly, Well 91-35-1 averaged 27.2 percent claystone throughout its entire 1500-foot drill depth. Table 2.3.1 illustrates the distribution of claystone/mudstone in the two drill holes. Studies in Burnout Canyon Creek have also demonstrated the self-sealing nature - inhibiting vertical movement of flow through the bedrock in the area. Based on the claystone/mudstone component observed in Well 91-35-1, the same effects are anticipated when undermining portions of Winter Quarters and Woods Canyon creeks.

Table 2.3.1

Depth (ft)	D.H. 74-26-3 (amount of claystone in ft.)	D.H. 91-35-1 (amount of claystone in ft.)
0-100	9	25
100-200	40	18
200-300	19	17.5
300-400	10	11
400-500	20	49
500-600	36	16

600-700	27	14.5
700-800	44	33.5
800-900	47	20.8
900-1000	22	21
1000-1100	27	37
1100-1200	17	29
1200-1300	21	43
1300-1400	29	34.5
1400-1500		39

The youngest geologic unit in the permit area is the Castlegate Sandstone, found only in a small area in the northwestern portion of the permit area. This unit consists of massive medium to coarse grained sandstones with interbedded conglomerates near the base.

Faults within the permit area commonly occur as zones of parallel to in-echelon fault segments with individual slips containing gouge zones ranging from 6 inches to 4 feet wide. Displacements are normally small (less than 20 feet) with the exception of the Connelville fault zone which forms the eastern boundary of the permit area It is suspected that faults have only local hydrologic importance within the Blackhawk formation because of its clay content in the permit area. Water emerged from the Star Point Sandstone along 2 faults encountered in Skyline Mine 3, resulting in some water drainage from the floor but no water dripped from the roof. As mining in Mine 2 progressed down dip and two the west, several north-south trending fractures and faults (with minimal offset) were encountered that produced hundreds of gallons a minute of water from the floor. The location of the major inflows are illustrated on Drawing PHC A-2 in the July 2002 Addendum to the PHC. The flow from these features only slowly diminishes over time. Age dating analysis of the water indicate the flow from these fractures do not have modern water (tritium analysis) and contain water 6,000 to

The analysis reports are arranged by seam, i.e., McKinnon, Upper O'Connor, and Lower O'Connor A; and then by sample location, e.g., roof, floor.

The locations of the exploration holes at which these samples were taken are shown on Plate 2.3.6-1.

Obtaining ground water data from abandoned mines in the area has been investigated but found not practical. The only abandoned portal in the permit area is the old Eccles Canyon Mine. This portal was sealed and covered during construction of the Skyline portal area surface facilities and is no longer accessible.

There are several abandoned mines in the adjacent area, located in Winter Quarters, Pleasant Valley and Boarding House Canyons. A search of UDOH and EPA (Storet) records did not reveal any discharge data from these old portals.

2.3.7 Groundwater Monitoring Program

The ground water monitoring program outlined in this section is a continuation of a program approved with the original Mining and Reclamation Permit Application. It incorporates practices designed to provide the baseline data necessary to validate the determination of the probable hydrologic consequences of proposed and existing mining and reclamation operations. The program also is designed to meet site specific requirements and incorporates the flexibility for change if necessary. Selection of the monitoring sites was an arduous process using the following criteria. An original baseline survey or Hydrologic Inventory was compiled in 1979, utilizing data collected from 1974 through 1979, where all possible springs, seeps and streams were monitored. Additional water monitoring data was collected for the North Lease from 1991 through 1993. Following the completion of the inventory and consultation with both DOGM and the U.S. Forest Service (USFS), representative monitoring sites were selected. Important parameters included geologic unit, critical area where damage may occur, quantity of flow, reasonable year round access, and representative distribution.

A monitoring program is being conducted at each of the ground water stations identified on Table 2.3.7-3 and depicted on Plate 2.3.6-1. Except where noted, samples are obtained at the monitoring sites three times a year. The monitoring periods are defined by the seasons. Samples are collected during the high flow season, April through June and the low flow season in August through September.

Late fall samples are obtained in October through November. These time periods were selected because the sites are usually inaccessible until late June and after November due to snow depth and frozen water courses. Several sites on Eccles Creek are monitored in December through February since they are adjacent to a maintained road and the water discharged from the mine normally keeps the stream from freezing over.

Water quality samples are collected from the 25 selected springs in the project area. The samples are comprehensively analyzed each year for the parameters listed in Table 2.3.7-1 and Table 2.3.7-2. All water samples collected for use in this permit have been collected and analyzed according to methods in either the "Standard Methods for the Examination of Water and Wastewater" or the 40 CFR parts 136 and 434. A listing identifying the station types is shown on Table 2.3.7-3.

In addition to the collection of the outlined water quality data, water level data has been collected from each of the wells (if functional) as scheduled on Tables 2.3.7-1, 2.3.7-2, 2.3.7-2A and 2.3.7-3, and noted on Plate 2.3.6-1. Water quality samples will be collected from the Waste Rock Disposal Site Well 92-91-03 in accordance with the schedule and parameter list shown on Table 2.3.7-5. Summary information on these observation wells is found on Table 2.3.7-4. Three wells, 79-14-2B and 79-22-2-1 and 79-22-2-2 have experienced casing failures, and are currently nonfunctional. There are no plans to replace these wells.

The amount of water discharged from each mine on each monitoring

completed in August 2002 but the interim report is not yet available. Skyline will submit this first and subsequent first progress reports for this project with its annual reports.

Samples obtained at the MC-sites will be monitored for total flow, TDS, TSS, and total phosphorous. In addition a stream stability cross-section and reach survey will be conducted approximately 75 yards downstream of the MC-6 monitoring location. The results of these analyses will be reported with the other mine water quality monitoring reports.

Sites MD-1, JC-1, JC-3, SRD-1, and ELD-1 were also added to the monitoring site list. MD-1, SRD-1, and UPDES 001 are all the same sample location, but with differing reporting requirements. They are a composite sample of the all water discharged from Skyline Mine to Eccles Creek. UPDES 001 samples on weekly basis with a specific analysis; SRD-1 reports flow-only on a monthly basis; and MD-1 is sampled on a quarterly basis with a full suite of water quality analysis. JC-1 and JC-3 are samples of the water discharged from the two James Canyon ground and mine dewatering wells. ELD-1 reports the total flow-only from both JC-1 and JC-3 on a monthly basis. ~~MD-1 and ELD-1, are monitored for total flow and the results are reported to the Division on a monthly basis.~~ Quarterly, MD-1, JC-1, and JC-3 are also monitored for TSS, TDS, and total phosphorous. Since JC-3 is a PacifiCorp UPDES site, it is monitored each month for flow, TSS, TDS, oil and grease, and total iron. The UPDES sampling results are forwarded to the Division monthly.

Spring monitoring sites WQ1-39, WQ3-6, WQ3-26, WQ3-41 WQ3-43, and WQ4-12 were added to the permit. Surface water sites CS-19, CS-20, and CS-21 were added as were wells 91-26-1 and 91-35-1. All of these sites are in the North Lease area. Location of these samples sites are illustrated on Drawing 2.3.6-1.

Skyline Mine has also obtained numerous water samples from within the mine for age-dating purposes. Samples have been analyzed for both stable and unstable isotopes; the majority being analyzed for tritium and carbon 14 content. The analyses results of these samples is discussed in detail in the July 2002 Addendum to the PHC. The results of repeated tritium sampling and analysis in a few location in the

Table 2.3.7-1
Comprehensive Water Quality Analytical Schedule
(Surface and Ground Water Stations)

Streams	Protocol	Comments
CS-1	A 1, 2, 6, 8	
CS-3	A 1, 2, 6, 8	
CS-4	A 1, 2, 6, 8	
CS-6	A 1, 2, 3, 6, 7, 8, 10	
CS-7 (F-5)	A 1, 2	
CS-8	A 1, 2	
CS-9	A 1, 2, 6, 8	
CS-10	A 1, 2	
CS-11	A 1, 2, 6, 8	
CS-12	A 1, 2, 3, 6, 8	
CS-13	A 1, 2, 3, 6, 8	
CS-14	A 1, 2, 3, 6, 8	
CS-15	A 13	
CS-16	A 1, 2	
CS-17	A 1, 2	
CS-18	A 1, 2	
CS-19	A 1, 2	
CS-20	A 1, 2	
CS-21	A 1, 2	
CS-22	D 11	
CS-23	D 11	
MD-1	A 7 and B	
SRD-1	B	
F-9	C 16	
F-10	A 1, 2 and C	
UP&L-10	A 1, 2	
VC-6	A 1, 2, 3, 6, 7, 8, 10	
VC-9	A 1, 2, 3, 6, 7, 8, 9, 10	Flow is sum of CS-6 and CS13
VC10	A 1, 2, 3, 6, 7, 8	
VC11	D 11	
VC12	D 11	
MC-1	A ~~7~~4	
MC-2	A ~~7~~4	
MC-3	A ~~7~~4	
MC-4	A ~~7~~4	
MC-5	A ~~7~~4	
MC-6	A ~~7~~4	
~~NL-1~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-2~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-3~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-4~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-5~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-6~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-7~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-8~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
~~NL-9~~	~~F 10, 13~~	~~North Lease Subsidence Points~~
NL-1 through NL-40	F	North Lease Subsidence Points
WRDS #1	A 1, 2, 6, 8	
WRDS #2	A 1, 2, 6, 8	
WRDS #3	A 1, 2, 6, 8	
WRDS #4	A 1, 2, 6, 8	
EL-1	A 14	Sample spring, summer, and fall for
EL-2	A 14	3 years beginning in 2004

Table 2.3.7-1 (cont.)
Comprehensive Water Quality Analytical Schedule
(Surface and Ground Water Stations)

Field and Laboratory Measurement Protocol

Water Level and Flow Measurements

A Stream and Springs: high spring (April - June), low summer flow (August - September), and late fall (October - November), and winter season (December - February) monitoring

B Stream, Springs, and Wells: monthly discharge measurements, reported in first 7 days following end of month

C Stream and Springs: monthly flows when accessible.

D Stream: seasonal discharge measurements (April - June, August - September, October - November)

E Monitoring well: seasonal water level measurement (April - June, August - September, October - November)

F Streams: monthly flows June through October, earlier and later if accessible. To be monitored ~~six months prior to, during, and following~~ one year prior to, during, and one year following ~~subsidence~~ undermining.

G Springs: high spring and late fall sampling

Water Quality

1 High spring and late fall (April - June and October - November) water quality field and operational laboratory measurements

2 Low summer flow (August - September) water quality field and operational laboratory measurements

3 Winter season (December - February) water quality field and operational laboratory measurements

4 Seasonal water quality field measurements, TDS, TSS, and total phosphorous

5 Seasonal water quality field measurements, TDS, TSS, and total phosphorous, C14, tritium, and stable isotopes deuterium and oxygen 18

6 Also oil and grease, phenols

7 Also oil and grease, phenols in winter season

8 Also phenols, total organic carbon, and cyanide

9 Also total phosphorous

10 Also dissolved oxygen

11 Seasonal flow only

12 Seasonal water levels

13 Field parameters only

14 Tritium

TABLE 2.3.7-3
MONITORING STATION IDENTIFICATION

ECCLES CANYON/MUD CREEK DRAINAGES

STREAM STATIONS - 22 Stations

CS-1	~~CS-2~~	CS-3	CS-4	CS-6	CS-9	CS-11	CS-15
VC-6	VC-9	VC-10	MC-1	MC-2	MC-3	MC-4	MC-5
MC-6	CS-19	CS-20	CS-21	VC-11	VC-12		

MINE DISCHARGE STATIONS - 4 Stations

CS-12 (Mine #3) CS-14 (Mine #1) MD-1 (Composite CS-12 & CS-14)
SRD-1 (Total Mine Site Discharge to Eccles Creek/Scofield Reservoir)*

FRENCH DRAIN STATIONS - 1 Station

CS-13

HUNTINGTON CANYON

STREAM STATIONS - 12 Stations

CS-7 (F-5)	CS-8	CS-1	CS-16	CS-17	CS-18	CS-22
CS-23	UPL-3*	UPL-10 F-9	F-10	EL-1	EL-2	

*Discontinued Spring, 1989

WASTEROCK DISPOSAL SITE

STREAM STATIONS - 4 Stations

WRDS #1 WRDS #2 WRDS #3 WRDS #4

GROUNDWATER STATIONS

SPRINGS - 25 Stations

S10-1	S12-1	S13-2	S13-7	S14-4	S15-3	S17-2
S22-5	S22-11	S23-4	S24-1 Sulfur	S24-12	S26-13	S34-12
S35-8	S36-12	2-413	3-290	WQ1-39	WQ3-6	WQ3-26
WQ3-41	WQ3-43	WQ4-12	8-253			

WELLS (MONITORING) - 19 Well Stations

W79-10-1A	W79-10-1B	W79-14-2A	W79-26-1	W79-35-1A
W79-35-1B	92-91-03	W2-1(98-2-1)	W20-4-1	W20-4-2
W99-4-1	W99-21-1	W99-28-1	W20- 28-1	JC-1
JC-3	ELD-1 (Total of JC-1 and JC-3)*	91-26-1	91-35-1	

WELLS, CULINARY -Referenced but not monitored

W13-1 W13-2 W17-1 W17-3 W24-1

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES)

001 Portal Area 002 Loadout Area 003 Waste Rock Area JC-3 James Canyon

* Sites are monitored for total flow only and the results are reported to the Division on a monthly basis.

is yielded as suspended sediment, with only a small fraction occurring as bedload. After March of 1999, the sediment yield to the Price River basin through Mud Creek increased by approximately 7%. This increase in load was determined by the Division using the results of TSS monitoring at Valley Camp sites VC-1 and VC-9 on Mud Creeks and Skyline site CS-6 on Eccles Creek. The Division calculated an average sediment yield for Eccles and Mud Creeks at 2,710 tons/year prior to March 1999 and 2,908 tons/year since March 1999 through June of 2002. The sediment yield will be monitored for Eccles and Mud Creeks and reported each year in the mine's annu1al report.

The suspended load in the stream flow of Eccles and Mud Creeks is being monitored as a result of the increased mine discharge. In addition to the stations already monitored on Eccles Creek as part of the existing monitoring program, six new sites have been added. These sites are MC-1, MC-2, MC-3, MC-4, MC-5 and MC-6. As discussed in the previous section, the sites are monitored for TSS. The first sampling of these sites occurred in June 2002 and the results reported to the Division. No significant increase to the TSS levels above background were noted during the initial sampling. (Site MC-5 is located on Mud Creek above the confluence with Eccles Creek and assumed to represent background).

2.4.4 Monitoring Program

The surface water monitoring program outlined in this section has been updated based on the findings and conclusions of the 1996 PHC by Mayo and Associates and as a result of a cooperative effort between the operator, the Division, and the Forest in an effort to better understand and monitor the effect of increased ground water inflows to the mine and mine discharge. It incorporates practices designed to provide the baseline data necessary to validate the determination of the probable hydrologic consequences of proposed and existing mining and reclamation operations. The program also is designed to meet site specific requirements and have

the flexibility for change if necessary. Specific attention has been given to insure that proper upstream and downstream monitoring is included within the monitoring program for all disturbed areas, and that adequate sampling of potentially impacted flow regimes is completed. Selection of the monitoring sites was an arduous process using the following criteria. An original baseline survey or Hydrologic Inventory was compiled in 1979, utilizing data collected from 1974 through 1979, where all possible springs, seeps and streams were monitored. Additional water monitoring data was compiled for the North Lease area from 1991 through 1993. Following the completion of the inventory and consultation with both DOGM and the U.S. Forest Service (USFS), representative monitoring sites were selected. Important parameters included geologic unit, critical area where damage may occur, quantity of flow, reasonable year round access, and representative distribution.

A PHC study completed in 1996 entitled "Investigation of Surface and Groundwater Systems in the vicinity of the Skyline Mines, Carbon, Emery, and Sanpete Counties, Utah; Probable Hydrologic Consequences of Coal Mining at the Skyline Mines and Recommendations for Surface and Groundwater Monitoring" by Mayo and Associates, recommended some changes to the original monitoring plan. These changes were made by Mayo and Associates after a careful review of local hydrogeology, monitoring conditions, sampling parameters, and sampling data. The changes proposed by Mayo and Associates are considered valid and reasonable and are therefore incorporated herein. An evaluation of UPDES and waste rock disposal site monitoring stations were not included within the scope of work completed by Mayo, but continue to be an integral part of the water monitoring program.

A copy of the 1996 PHC evaluation is included within Appendix A-1 Volume 2 of this MRP. An update to the PHC, "Addendum to the PHC, July 2002" has also been included in this M&RP. Since the modifications to the PHC have taken place over time and conditions within the mine have changed, it should be assumed that where the most recent text conflicts with text in earlier modifications or original text, the latest supercedes the earlier.

Surface water monitoring programs are conducted at each of the appropriate stations identified in Tables 2.3.7-1, 2.3.7-2, 2.3.7-2A and 2.3.7-3 and

As part of the Skyline Mine subsidence monitoring plan, ~~nine~~ a total of 40 new water monitoring sites have been identified in the North Lease area (Table 2.3.7-2A). Sites NL-1 through NL-~~7~~40 have been selected to monitor flows on the ~~tributaries to and~~ perennial reaches ~~on~~ of both Winter Quarters and Woods Canyon ~~creeks~~ drainages ~~six months~~ one year prior to , during,

and ~~at least six months~~ one year following ~~subsidence due to~~ longwall undermining of the perennial section of stream ~~mining~~. ~~Sites NL-8 and NL-9 have been selected to monitor flows in Woods Canyon under the same frequency as the NL-1 through NL-7 sites. Flow, conductivity, pH, dissolved oxygen, and temperature of the water will be measured at each location.~~ The sites will be monitored monthly in June through October. If accessible earlier than June or later than October, the mine will monitor the sites. The results of the monitoring will be reported with the other required monitoring data. The purpose of this monitoring is to determine the effects, if any, on the stretches of perennial streams in the Winter Quarters Creek and Woods Canyon Creek drainage that will be subsided due to mining. Monitoring points, in perennial reaches running perpendicular to the longwall panels, are positioned above the gate-roads and center of each panel. Longwall panels are approximately 850-feet wide, creating a flow-monitoring spacing of approximately 425-feet. Monitoring points in perennial reaches running parallel to the longwall panels are spaced at approximately 850-feet. Since monitoring is dependent on the timing of mining, monitoring points will be added and dropped as mining advances. As mining advances through the perennial sections of the drainage, and the monitoring indicates no affects to flow, the Permittee may modify the spacing of the monitoring points. This monitoring will also help indicate if mitigation is required for loss of surface or ground water and, subsequently, habitat associated with the water.

Skyline will conduct field studies to determine the location of the perennial portions of both Winter Quarters and Woods Canyon Creeks, though no mining is currently planned within the next five years in the Woods Canyon drainage. The perennial nature of the streams will be determined

change in the stream morphology was not significantly different than changes that occur in similar stream systems naturally. Biweekly flow monitoring and aerial photographic surveys continue each year as mining continues in the area. Additionally, three years of macroinvertabrate studies and two years of fish population surveys have been conducted starting in 2000. These studies are described in greater detail in Section 2.8.1.

The purpose of the Burnout Canyon study was to determine the impacts of undermining perennial streams in the Skyline Mine area. The intent of the study was to determine if significant impacts would occur by undermining the Burnout stream and, if no significant impacts occurred, then the Forest would consider allowing the undermining of perennial streams with similar geologic and geomorphic conditions to occur. Skyline Mine ~~intents~~intends to ~~undermining of~~ undermine Winter Quarters Canyon based on the positive results of the Burnout Canyon study. Skyline ~~recognizes~~ has collected or committed to collect additional baseline data necessary to adequately monitor environmental parameters possibly affected by ~~will need to be collected prior to receiving Forest permission to proceed with~~ subsiding Winter Quarters Canyon. ~~The current 2002 mine plans do not anticipated longwall mining in the Winter Quarters area thus allowing the mine time to obtain the needed baseline data.~~

When subsidence occurs, the subsidence cracks tend to seal rapidly, preventing the deep percolation and subsequent loss of water previously destined for springs and other water sources. The location of a spring may change by a few feet, but no significant loss of water is anticipated. The sealing of potential cracks will be accelerated where subsidence occurs under stream bodies, due to the natural deposition of silt in the stream channel along with the swelling of the shale.

Although the Blackhawk Formation contains partially or completely saturated sandstone channels above the proposed mine workings, a relatively small quantity of water is being encountered in the mine due to the impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water. Ground water within the Blackhawk formation above the mine workings was determined in the 1996 PHC to be found within highly localized perched aquifers. The 1996 PHC evaluation failed to locate a regional ground water aquifer within the immediate area. The relatively small quantity of water being encountered in the mine was believed due to 1) the general impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water, and 2) the local nature of local perched aquifer systems. The inflow to the mine had been less than 100 gallons per minute per active face, with mine entries generally dry approximately 100 to 200 feet

for the mine, prior to March 1999 to discharge water with 1000 mg/l TDS. However, after the large inflows into the mine were encountered in March 1999, the volume of water discharge increased steadily and the concentration of TDS decreased. Also, at that time the mine began to have trouble passing the chronic Ceriodaphnia dubia toxicity test required by the UPDES permit. It was determined through extensive testing that the toxicity test was failed due to a slight increase in the nickel concentration in the water. The toxic limit of dissolved nickel concentration appeared to be 15 ug/l or greater and the water discharged from the mine in late 1999 until the end of 2001 contained a maximum of 42 ug/l dissolved nickel. These concentrations of dissolved nickel are well below drinking water standards. The significant inflow to the mine from the 10 Left area and changes of how water was handled underground resulted in a decline in TDS and dissolved nickel over time. As a result, the mine has been able to pass its chronic water testing. However, while the mine has been producing water with a TDS concentration less than 500 mg/l, the total volume of water discharged results in more than 7.1 tons/day of TDS released to Eccles Creek. The mine and the Utah Division of Water Quality are currently working on modifying the mine's UPDES discharge permit to limit the water discharged to a 500 mg/l concentration of TDS and no total ton per day limit.

A second UPDES permit is being obtained to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. PacifiCorp has seeked to obtain the UPDES permit from the Utah Division of Water Quality by May 1, 2003 and will act as the UPDES permit operator. However, since it is mine water, Skyline will be obligated under SMCRA to assure the quality of the water discharged is within the UPDES permit limits assigned to JC-3. Skyline will submit the required DMRs to the Division as required in Section 2.3.7.

Periodically due to difficult recovery conditions or roof collapse, mining equipment is abandoned underground. Prior to leaving equipment underground, hazardous materials and lubricating fluids are drained when possible. Since the equipment is steel and not too different compositionally from the roof support throughout the mine, contamination to ground water from abandoned equipment is not anticipated. A map illustrating the location of equipment left underground is provided as Drawing 2.3.6-2. The drawing includes a description of each piece of equipment.

Because of the high alkalinity and low acidity concentrations in the area (differing normally by two orders of magnitude), acid drainage problems do not occur as a result of mining. This is supported by the fact that coal in the area has a low sulphur content.

~~The amount of water that is discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at Skyline Mine, the rate of water to be consumed is estimated to be 51,870,720 gallons per year (approximately 271 gpm).~~ Skyline Mine anticipates potentially discharging approximately 2,800 gpm of mine water to Eccles Creek after the completion of mining and subsequent abandonment of the 11 Left, 12 Left A and B, and 6 Left B panels in 2004. However, this rate may vary with changes in the operation of JC-3 and because of the steady decline in potentiometric head within the aquifer discharging into Mine #2. Assumptions used in developing the discharge amount can be found in July 2002 Addendum to the PHC in Appendix F.

The water consumed in operating underground equipment, dust suppression, and evaporation is obtained from ground water sources within the mine. These underground water sources are not connected to the surface waters in the area. Extensive research has been performed by the mine to verify that water currently entering the mine is not coming from the surface or depleting surface waters. The recent July 2002 Addendum to the PHC presents data supporting this statement. The data suggests the water intercepted underground is at least 4,000 to 25,000 years old and, based on the results of tritium analyses from most of the mine waters, does not typically contain water that has been exposed to the atmosphere in the past 50 years. Additionally, the steady rate of decline in ground water levels in monitoring wells within the permit area and the results of age-dating the ground water inflows to the mine indicating the water is not getting appreciably younger, suggests that the aquifer is not receiving significant recharge of "young" surface waters.. Continued monitoring by the mine of the surface waters and seeps and springs flows in the permit and adjacent areas have shown no discernable impacts due to the increased mine inflows that were encountered in March 1999 and have continued through November 2002. It is the operator's position that the water consumed in operating Skyline Mine is not depleting surface water sources. In fact, there is an overall net gain to local river systems discharging to the Colorado River as a result of Skyline Mine discharge.

The following information is supplied as required by the Windy Gap process as it applies to existing coal mines in the Upper Colorado River basin:

Mine Consumption: (culinary well - Water Right 91-5010) =41.69 ac-ft (2004 consumption)

Ventilation Consumption / Evaporation:

(assumes 70 deg. F, 60 total days annually, 20% humidity air intake, 95% humidity air out-take; air density difference of 0.001 lbs/ft)

(353,312 cu-ft/min) (.001)(0.1198) = 42 gal/min.

= 11.21 ac-ft annually

Coal Producing Consumption / Coal Moisture Loss:

- 6.1% Inherent moisture
- 8.54 % run-of-mine moisture
- 2.44% moisture added to coal by cutting (8.54-6.1)

Projected 2005 Tonnage 237, 500 tons

Projected 5 yr Average 1,898,672 tons

Tons water/year = (1,898,672)(0.0244)= 46,328 tons water/year

Lbs water/year = 92,656,000

Gallons/year = 92,565,000 (0.1198)=11,100,189 gallons/year

=34.06 ac-ft annually

Sediment Pond Evaporation:

Evaporation estimate calculation uses evaporation data from Pacificorp evaporation pan located at Electric Lake spillway. Data was from 1998 through 2003.

Pond 001 (Mine Site) - 0.39 acre (surface area)
- 0.15 ac-ft/month (ET)
- 345,715 (gallons/year)
- 1.06 ac-ft/yr

Pond 002 (Rail Loadout) - 0.44 acre (surface area)
- 0.15 ac-ft/month (ET)
- 390,037 gallons/year
- 1.20 ac-ft/yr

Pond 003 (Refuse Pile) - 0.27 acre (surface area)
- 0.15 ac-ft/month (ET)
- 239,341 gallons/year
- 0.73 ac-ft/yr

Total Annual Pond Evaporation = 2.99 ac-ft

Springs and Seeps Effects From Subsidence - Not Applicable

Alluvial Aquifer Abstractions into Mine - Not Applicable

Deep Aquifer Pumpage - Not Applicable

Postmining Inflow - (0)

Direct Diversions - Not Applicable

Dust Suppression - 5,000 gallons/truck load. Data based on 2003 use; last fully active year.

= 3.7 ac-ft/yr

Mine Discharge - last 6 month average = 3,757 gpm = 6,059 ac-ft/yr

Using the Windy Gap Process at the Mine site, water depletions include Mine Consumption, Ventilation Consumption, Coal Producing Consumption, Sediment Pond Evaporation, and Dust Suppression totaling approximately 94 acre-feet per year. The only addition to the system, as defined by the Windy Gap process is the mine discharge which is currently averaging approximately 6,060 acre-feet per year, indicating the Skyline Mine has a net gain of approximately 5,966 acre-feet year to the Colorado River drainage system.

2.5.3 Alternative Water Supply

OSM Regulation 30 CFR 783.17 requires that alternative sources of water supply be identified if mining impacts will result in the contamination, diminution, or interruption of existing sources.

Revegetation efforts on slopes over 60 percent at the mine site have been disappointing. On these steep slopes at the mine site several different techniques have been used on different occasions with very little success. These techniques have included burlap netting, hydromulching, hand seeding and transplanting of shrubs and seedlings. Revegetation on these slopes may have to be postponed until final reclamation when the slope angle will be altered making successful revegetation much more probable.

2.7.5 U. P. & L. Tract

The general vegetation community mapping was done using existing U. S. Forest Service vegetative type maps prepared by the Manti-LaSal National Forest, Price, Utah, aerial photography, and limited ground truthing. These vegetative communities are shown on Dwg. 2.7.1-1a.

There are four vegetative communities within the tract. They are the sagebrush/grass, riparian, conifer-timber and the aspen vegetative community. The following table presents the approximate number of acres associated with each vegetative community.

Sagebrush/grass	103 Acres
Riparian	13 Acres
Conifer-timber	103 Acres
Aspen	240 Acres

Sagebrush/grass communities are dominated by two species of sagebrush, Mountain Bigsage(Artemsisia tridentata var. vaseyana), and Silver Sage (Atremisia cana). Grass species include Slender wheatgrass (Agropyron trachycaulum), subalpine needlegrass (Stipa lettermannii), and Sandbury blue greass (Poa secunda). Other common species in the community are low rabbitbrush (Chrysothamnu viscidiflorus), Lousiana sagewort (Artemisi ludioviciana), aster (Aster spp.), yarrow (Achilleamillefolium), and Indian paintbrush (Castilleja spp.), Western coneflower (Rudbeckia occidentalis), Sweet Cicely (Osmorhiza occidentalis), and Lovage (Ligusticum porteri).

The riparian communities are immediately adjacent to the creek beds and vary from only one to two feet on either side of the stream channel to several feet wide. The drier areas of the riparian community are comprised of species such as Kentucky bluegrass (Poa pratensis), bentgrass (Agrostis alba) and Ross sedge (Carex rossii). The wet portions would include species such as

Water sedge (Carex aquatilus), Nebraska sedge (Carex nebraskensis), Baltic rush (Juncus balticus), and Hairgrass (Deshampsia caespitosa).

Conifer-timber lands are dominated by Englemann spruce (Picea englemanni), and subalpine fir (Abies lasiocarpa). Since the overstory of conifers is quite often very dense the understory varies from relatively little to moderate ground cover, and is often comprised of Gooseberry (Ribes montigenum), Arnica (Arnica cordifolia), Groundsel (Senecio serra), and Lupine (Lupinus alpestris).

The Aspen community is the most common community in the tract area. Aspen (Populus tremuloides), is the dominant overstory species. Depending on the area and environmental variables, Snowberry (Symporicarpos oreophillis), Red elderberry (Sambucus racemosa), Oregon grape (Mahonia repens), Western coneflower (Rudbeckia occidentalis), Groundsel (Senecio serra), Needle and Threadgrass (Stipa columbiana), and Kentucky bluegrass (Poa pratensis) are the dominant understory species.

Within the proposed tract there are no existing farmlands, prime or unique rangelands.

Since there are no surface facilities planned in the tract, the potential for disturbance is limited to that caused by subsidence. Subsidence monitoring on areas already mined indicates that subsidence damage is minimal.

James Canyon Area

In August, 2001, the permittee placed a pipeline **and buried power line** in James Canyon. The pipeline originated at a drill pad located in the SW1/4SW1/4, Section 35, T13S, R6E. It **was** placed in **the** abandoned county road that is runs the entire length of the canyon.

The buried power line originated at the Questar property at the head of Boardinghouse Canyon and continued along the Monument Peak Road to the head of James Canyon. The power line continued down James Canyon to the drill pad. The power line is located in a portion of SE¼SW¼, Section 25, T13S, R6E and NW¼, Section 36, T13S, R6E. The road was reclaimed in the 1970's when construction of the Electric Lake dam was completed. Reclamation activities consisted of constructing water bars across the road every few hundred feet. No soil was redistributed across the road as part of reclamation activities. Vegetation, consisting of grasses, rabbit brush, and

sagebrush has begun to encroach upon the road since its closure. The road was reportedly eseeded in the early 1970's but the exact seed mix used is not known at this time.

No permanent significant modifications to the current land surface are anticipated to occur. No work will occur outside the boundaries of the abandoned county road. Vegetation that is present in the area of the excavation will be removed and redistributed with the topsoil.

The pipeline from the well to Electric Lake and power line from the Questar property to the head of James Canyon were reclaimed immediately after construction. The power line trench has been compacted and regraded. The pipeline surface was deep gouged and left in a roughened condition. The disturbed area adjacent to the road was reseeded with a seed mix based on the results of vegetation study of the area conducted in September of 2001.

A vegetation study was conducted in the James Canyon area in September of 2001 with the report completed in October of 2001. During the study, an area approximately one acre in size located adjacent to the disturbed road was identified to be used as the "Reference Area" for determining final revegetation success. The data obtained from the study show the understory cover to be 50.13% and the overstory cover as 6.36%. The mean total living combined cover is 64.50%.

The most common overstory species is aspen (Populus tremuloides). The aspen overstory cover was 5.88%.

White fir (Abies concolor) and subalpine fire (Abies lasiocarpa) are in the immediate area. The woody species density in the "Reference Area" was a total of 47 individuals per acre with the aspen comprising most of the density at nearly 43 individuals per acre. The most common understory specie is slender wheatgrass (Elymus Trachycaulus) the next common specie was Western coneflower (Rudbeckia occidentalis).

Seed Mix

A list of plant species suggested to be used for a seed mix for revegetation at final reclamation has been provided on the next page. This list was formulated based on the sample data from the study previously described of the native plant communities in the area, and communications with biologists from the State of Utah, Division of Oil, Gas & Mining, the USDA Forest Service, as well

as seed vendors for consideration of seed availability at the proposed seeding dates. Slight alterations to the list may still be necessary when the seed mixtures are prepared. These alterations will be approved by the Division and Forest Service prior to implementation.

The vegetative survey described above was performed by Dr. Patrick D. Collins in accordance with guideline supplied by the State of Utah, Division of Oil, Gas & Mining. The report can be found in Appendix A-2

Revegetation Standards for James Canyon Road

The revegetation standard for the living understory cover will be 58% and for the woody species the density standard will be approximately 50 plants per acres. These figures are based on the

recommendations from the vegetation survey conducted by Dr. Patrick D. Collins that can be found in Appendix A-2.

Final Revegetation Seed Mix for the

Aspen/Mountain Herblands in James Canyon

	PLS/AC[1)]	PLS/FT[2]
SHRUBS[2)]		
Artemisia tridentata var. vaseyana	0.10	5.74
Sambucus racemosa	2.00	13.13
Symphoricarpos oreophilus	4.00	6.89
FORBS[2)]		
Achillea millefolium	0.10	6.36
Linum Lewisii	2.00	12.76
Lupinus alpestris	15.00	4.30
Osmorhiza occidentalis	4.00	2.74
Penstemon strictus	**1.00**	**13.59**
Viguiera multiflora	**0.15**	**3.63**
GRASSES[2)]		
Bromus carinatus	**2.00**	**4.59**
Elymus glaucus	**2.00**	**5.05**

Elymus trachycaulus	**1.50**	**5.51**
Festuca idahoensis	**0.50**	**5.17**
Festuca ovina	**0.30**	**4.68**
Phleum alpinum	**0.50**	**11.48**
Poa pratensis	0.10	5.00
Poa secunda	0.30	6.37
TOTALS	34.05	99.13
1)= Broadcast Rate 2)= Species changes may be made by a qualified botanist based on availability. PLS = Pure Live Seed		

2.7.6 VEGETATION OF THE NORTH LEASE TRACT AREA

The North Lease Tract Area is located adjacent to the northernmost boundaries of the current Skyline Mine permit area. Much of this area is located within and adjacent to Winter Quarters Canyon.

Because no surface disturbance is planned for this area, no quantitative data were compiled of the vegetation. Instead, a review of the existing information and data of the North Lease Tract and adjacent areas was done.

During August 2002 aerial photographs, collecting both infrared and black and white images, were taken of the North Lease Tract area to provide baseline vegetation data. Aerial photographs ~~will be~~ are taken annually, and will continue to be taken to detected ~~changes between~~ variances from the baseline. ~~and~~ Annual photographs will be interpreted by a qualified person and a report prepared for inclusion in the annual report.

PLANT COMMUNITIES

A report was prepared earlier by *Mt. Nebo Scientific, Inc.* (Collins 1992) of the vegetation of the Winter Quarters Canyon area (North Lease Tract Area). This report was submitted to the USDA Forest Service. The report has been included in Appendix A-2.

Methodologies for this previous study relied on general vegetation mapping done by using existing information and limited ground-truthing techniques. Most of the mapping was done using existing maps and data from range analyses prepared by the USDA Forest Service (Manti-LaSal National Forest, Price, Utah).

Plant community named in the aforementioned study were revised to be consistent with the existing vegetation map of the permit area (Drawing 2.7.1-1a). The existing vegetation map of the area was revised using both black and white and color aerial photography. No field work or ground-truthing methods were implemented.

In October 2002 the vegetation at specific sites along the perennial streams within the North Lease was ground-truthed. This information is included in Appendix A-2 titled, "Riparian Plant Community Survey near Scofield, Utah - Winter Quarters and Woods Canyon 2002". Also in Appendix A-2 is "Biological Studies in Winter Quarters Canyon Creek and Woods Canyon Creek - A Study Plan" dated April 2005. The Study Plan outlines the method to be used to collect both qualitative and quantitative data to delineate areas of riparian vegetation. Using USFS Level III protocol transect lines will be established perpendicular to the stream channel at approximately 800-foot intervals for a baseline vegetation survey. Two years prior to longwall undermining any section of perennial streams, the transect interval will be increased to approximately 400-feet and surveyed each subsequent year through two years after mining has been completed for each longwall panel. The combined increase in transect interval and surveying the transects on an annual basis will provide adequate monitoring of the riparian areas. In addition, since riparian vegetation is closely related to the available flow in the perennial sections of the stream, additional flow monitoring sites have been established in the perennial sections of the stream that correspond to the longwall panels and areas of possible subsidence (See section 2.4.4 for monitoring plan details, Figure 2.3.6-2 for locations). ~~This information will be gathered in conjunction with information being gathered for the Manti-La Sal Forest Service in the preparation of an Environmental Assessment. Total acreage of each vegetation type for the North Lease area will be provided once this information has been gathered and compiled.~~

Subsequent to the data collection outlined in the "Biological Studies Plan" in 2005, the baseline information will be submitted to the Division, to be included in Appendix A-2. All additional information will be submitted on an annual basis or as the information becomes available.

Aspen

The Aspen community was the most common vegetation type of the Winter Quarters Tract Area. Aspen (*Populus tremuloides*) was the dominant overstory species, whereas, depending on the area and environmental variables, snowberry (*Symphoricarpos oreophilus*) or Oregon grape (*Mahonia repens*) were the dominate understory species.

Conifer Timber

Also important by relative number of acres, these communities were dominated by Engelman spruce (*Picea engelmanii*) and subalpine fir (*Abies lasiocarpa*). Understory varied from relatively little to moderate ground cover, and often was comprised of gooseberry currant (*Ribes montigenum*).

Sagebrush

The Sagebrush communities that were mapped were dominated by Vasey sagebrush (*Artemisia tridentata* var. *vaseyana*) and various grass species i.e. slender wheatgrass (*Elymus trachycaulus*) and subalpine needlegrass (*Stipa columbiana*). Other common species of the community were low rabbitbrush (*Chrysothamnus viscidiflorus*), Louisiana sagewort (*Artemisia ludoviciana*), aster (*Aster* spp.), yarrow (*Achillea millefolium*) and Indian paintbrush (*Castilleja* spp.).

Although surface disturbances are not planned and the submittal of quantitative data was not necessary for the North Lease Tract Area, baseline quantitative data of many of the same communities located near the Skyline Mine site have been taken for previous studies. These additional data sets have also been included in Appendix Volume A-2 of the Skyline Mine MRP.

THREATENED & ENDANGERED PLANT SPECIES

Per personnel communication with Bob Thompson, USFS Botanist on November 1, 2002, "none of the currently listed USFS threatened, endangered or sensitive species are found in the Winter Quarter's Lease area". In addition to their being no species of concern in the USGFS Winter Quarter's Lease area, no surface disturbance is planned for the area.

HABITAT LOSS

In the unlikely event it is determined that mining-related subsidence causes material damage or a loss of riparian habitat, the Permittee commits to using the best technology currently available (BTCA)to mitigate the damage. The repair efforts will be coordinated and agreed upon by Mine, DOGM, and USFS personnel. Repairs related to disruption of a water supply are addressed in Section 2.5.3.

spawning gravel beds and the amount of fine sediments is not high enough to hinder spawning.

Huntington Creek has a diverse aquatic community with macroinvertebrate taxa representing all trophic levels. The successful cutthroat trout spawning and high number of resident trout evidence the high quality waters and habitat of Huntington Creek plus the ability of the macroinvertebrate community to support quality fisheries. Cutthroat trout, according to Utah Division of Wildlife Resources (UDWR) surveys, are increasing in numbers in Huntington Creek above Electric Lake. Trout produced in Huntington Creek provide an important part of the total number of fish in Electric Lake.

Winter Quarters Canyon Creek

As indicated in the 1995 environmental assessment prepared by the Forest Service and the Bureau of Land Management Winters Quarters Canyon Creek has a moderate population of macroinvertebrates. Perennial flow in the canyon has produced Stonefly larvae as far up as Box and Bob's Canyons. Mayfly nymphs were also found present in waters tested. Cutthroat trout were found within the creek east of the Forest Boundary on June 7, 1994 indicating fish are likely within perennial sections of the creek containing significant flows. Surveys conducted in Winter Quarters Canyon Creek in 2002 and 2003 indicate similar conditions exist and species were present.

Woods Canyon Creek

As indicated in the 1995 Environmental Assessment, Mayfly nymphs were found within the upper portions of Woods Canyon Creek in higher quantities than those found within Winter Quarters Canyon. Stonefly larvae were also found as high as the fork in the stream near the center of Section 34 (T 12 S, R 6 E). No fish were seen during the 1994 field survey although some may have been present. Surveys conducted in Winter Quarters Canyon Creek in 2002 and 2003 indicate similar conditions exist and species were present.

~~During the Fall of 2002 and early Summer 2003 fish and macroinvertebrate data for the perennial streams within the North Lease area will be gathered in conjunction with information being gathered for the Manti-La Sal Forest Service in preparation of an Environmental Assessment.~~

James and Burnout Creeks

A fish and macroinvertebrate monitoring program for James and Burnout Creeks will be implemented prior to undermining the lower portion of James Canyon. The fish survey consists of multi-pass electro fishing to estimate fish populations in the streams for one year and then every third year thereafter. The fish surveys will be performed in the fall of each year on or about the same date. The fish survey was initiated on October 16, 2001.

A macroinvertebrate survey of Burnout Creek will be performed twice a year for two consecutive years and then every three years thereafter. This survey will be performed in the fall and spring of each year, with the fall macroinvertebrate survey will being performed in conjunction with the fall fish survey. The macroinvertebrate survey was initiated on October 16, 2001.

A macroinvertebrate survey of James Creek initiated on October 16, 2001 will be performed twice a year for two consecutive years and then every three years thereafter or for a period determined by Canyon Fuel Company, LLC, DOGM and the DWR, to be long enough to provide data to establish population trends . This survey will be performed in the fall and spring of each year on or about the same date. The fall macroinvertebrate survey will be performed in conjunction with the fall fish survey.

The following methods have been used previously on this creek and will continue to be used for future macroinvertebrate sampling. Slight variations to the methods may occur during the field work or based on comments from regulatory agencies.

Three benthic sites will be sampled. They will be located beginning approximately 162 meters (528 feet) above the reservoir. ~~A map with these stations will be prepared with the next sample report for James Creek.~~ Refer to Plate 2.8.1-1 for all macroinvertebrate sample site locations. Note that macroinvertebrate sites sample reaches of a stream - site locations are plotted at the approximate mid-point of the reach of the sample site.

Quantitative samples will be taken with a modified box sampler. The three samples taken will be field preserved in 70% ethyl alcohol and returned to the laboratory for processing. The samples will be sorted and invertebrates identified to the lowest possible taxonomic level using the keys of Merritt and Cummins (1996). Those of questionable identity will be further examined and identified under

The collected data will be compared to the previous data collected in 1979 through 1983 and included in Appendix A-3. After comparing historical data with data obtained in the three year study starting in 2002, a determination will be made if the macroinvertebrate in Eccles Creek are impacted by the mine water discharge. If impacts are found, the significance of the impacts will be determined and appropriate mitigation is necessary will be performed.

Fish studies will be conducted on Eccles Creek in 2003.The fish study consists of multi-pass electro fishing to estimate fish populations in the stream for one year and then every third year thereafter. The fish studies will be performed in the fall of each year. Results from sampling will be compared with all available historic studies done on this creek.

Aquatic Monitoring Summary

Aquatic monitoring data have been accumulated for a period of six years. Summaries of these data are presented in Tables 2.8.2 and 2.8.3. Backup data for these summaries, including the consultants original report and subsequent summary reports, may be found in Appendix Volume A-3, Aquatic Wildlife.

During a 23 year time span macro-invertebrate data was collect on 24 site visits to Eccles Creek and compiled into a report entitled "A Compilation and Comparison of Eccles Creek Macro-Invertebrate Data for the Period of 1979 - 2002" prepared by Dennis Shiozawa, Ph.D., Professor of Fisheries Biology at Brigham Young University, Provo, Utah. The report documents that Eccles Creek has undergone changes in the benthic community structure through the years of study and demonstrates the resilience and adaptability of the creek to disturbance by multiple sources. Burnout, James, Eccles, Winter Quarters, and Woods canyon creeks have continued Aquatic monitoring reports that are submitted to the Division of Oil, Gas, and Mining in the required Annual Report when the information is compiled. These reports ~~is~~ are available for review at the Division of Oil, Gas and Mining public library.

W. Tanner (1953, 1957a and b, 1966-with Banta, 1969-with Morris, and 1972-with Fisher and Willis); and Woodbury (1952).

The area of concern in this report is located in the upper edges of sagebrush (Artemisia) and into the Aspen-Spruce-Fir plant communities.

Amphibians

Based on the extensive literature review and limited field work it was determined that probably four and potentially six species of amphibians (Table 2.9-3) inhabit the area of concern that provides substantial value habitat for all species listed. All amphibians are protected, but since the species listed are all widespread throughout the mountains of Utah, none are treated as high-interest species, and, therefore, are not individually discussed. It is doubtful if the development action would seriously impact populations but rather localized individuals in the areas of total habitat destruction. An exception to this would result if subsidence interrupted underground aquifers and caused drying of present wet or riparian habitats essential to reproduction.

Amphibian surveys, focusing on locating the Spotted Frog and Boreal Toad, will be conducted in Spring and Summer 2005 depending on the appropriate survey time. The survey for the Spotted Frog will only focus on areas that will be longwall undermined in 2005, additional surveys will be conducted as longwall mining advances, if necessary. The entire survey for the Boreal Toad will be conducted in both Winter Quarters Canyon and Woods Canyon in 2005. During the Boreal Toad survey, an assessment will be made whether suitable Spotted Frog habitat exists in the two drainages and whether additional Spotted Frog surveys are necessary. A detailed description of the Amphibian Studies outlining survey timing, optimum season, and methods is located in Appendix A-2, "Biological Studies in Winter Quarters Canyon Creek and Woods Canyon Creek - A Study Plan". In the event either or both of the amphibians are encountered, the Permittee commits to implementing suitable protection methods, in consultation with the appropriate regulatory agencies (DOGM, USFS, DWR, etc.).

Reptiles

Based on the literature search and limited field work it was determined that probably 10 and potentially 15 species of reptiles (Table 2.9.3) occupy the mine land area that is considered as substantial value habitat for all 15 species. All reptiles are protected, but since the species listed are all widespread throughout montane habitats in Utah, none are treated as high-interest species and therefore, are not individually discussed. It is doubtful if the development action would seriously impact populations but it will destroy the habitat for individuals living in the areas of total habitat destruction surrounding the mine portal, conveyor, storage facilities and access roads.

2.9.3 Endangered and Threatened Species

Passage of the Endangered Species Act of 1973 (Public Law 23-205) provided a legal basis for establishment of lists of endangered and threatened plants and wildlife (Tables 2.9-4, 2.9-5, and 2.9-6).

According to National Wildlife Federation (1977), Dalton (1978) and the Federal Register (1979), there are no endangered or threatened species of amphibians or reptiles, or any threatened mammals that inhabit the south-eastern region of Utah. Dalton (1978), however, indicates that one endangered species, the black-footed ferret, might be found in the Wasatch Plateau east of the Skyline Drive. Durrant (1952) reports that he knows "...of no occurrence of the black-footed ferret north of the Colorado River in Utah...". There are unconfirmed reports of black-footed ferrett sightings east of Castle Dale and Ferron in Emery County, Utah. Many hours have been spent trying to verify the presence of these animals. Up to now these efforts have been unsuccessful. Observations on all of the Skyline lease and immediate surrounding areas show no signs of prairie dog colonies nor sufficient ground squirrel populations to support ferret populations (Fig. 2.9.3-A).

2.9.4 Impact Analysis and Protection of Wildlife

Numerous precautions were taken during construction of Skyline Mine to protect the wildlife resources. While the disturbances during the operational phase are greatly reduced, the following concerns have been and are still being considered: (1) surface disturbance, (2) loss of habitat, (3) noise, (4) human activity and (5) air pollution. Any one, all or a combination of the above perturbations can impact terrestrial vertebrates.

2.10 RAPTORS

A raptor study was conducted in 1980 by Dr. Clayton White of the faculty of Brigham Young University. Subsequent surveys were performed in the area by the Utah Division of Wildlife Resources ("DWR") in 1993, by DWR, DOGM, and Coastal in 1995, by DWR and Canyon Fuel Company ("CFC") in 1997, and CFC and DWR in 1999. This section summarized these reports. Complete copies of the reports may be found in Appendix Volume A-2.

In 1980, the Skyline Mines project area was studied by Dr. White during two different periods, a two-day early spring period and four-day brooding season period. Of prime consideration in this study was the determination of the presence or absence of two threatened or endangered species, the peregrine falcon (Falco peregrinus) and bald eagle (Haliaeetus leucocephalus). Additionally, all other raptors seen were recorded. Because of the elevation of the mines and the nature of the habitat, the numbers of individuals and numbers of species (diversity of raptors was found not to be as great as compared to lower elevations where the habitat was and continues to be less uniform.

In addition to Dr. White's reported field observations, the federal and state resource managers in the area were contacted to obtain information on raptors presence. Don Ward, U. S. Forest Service Biologist and Larry Dalton, Utah Division of Wildlife Resources Biologists, had only general and limited information on the area. However, as an indication of the species that might be expected to occur in the Skyline Mines area, data from Jones (1979) are given in Table 2.10.1. These data come~~s~~ from the area between Huntington and Ferron Canyons to the south of Skyline Mines. The frequency or density of raptors studied by Jones was also highest at elevations lower than the equivalent to the Skylines Mine area. Several species of raptors may pass through the area in migration, but their numbers are not known nor has their length of stay been documented. Species likely to pas through the area are the marsh hawk (Circus cyaneus), Swainson's hawk (Buteo swainsoni), bald eagle (Haliaeetus leucocephalus), and rough-legged hawk (Buteo lagopus).

2.10.2 RAPTORS OF THE NORTH LEASE TRACT AREA

A raptor study was conducted by White (1980) for the Skyline Mine area and summarized in Section 2.10 of this document. The raptor report White (1980) can be found in Appendix Volume A-2. Prime emphasis was given to the threatened or endangered species -- the peregrine falcon and the bald eagle, but other raptors were also recorded during the field work of the study.

Another raptor survey was performed at the time of the wildlife study by Parrish (1992). Within this report a table was formulated that comprised 15 diurnal raptors and 10 species of nocturnal raptors that potentially occur in the project area. An aerial survey by helicopter was performed on March 5, 1992 where 11 raptor nests were mapped, five of which were within the boundaries of project area. The remaining nests were within 1 mile of the area. A large nest, probably used by golden eagles, was located in Woods Canyon, just outside the permit boundaries.

A subsequent ground-truthing study was done to check the presence or absence of raptors in the 11 nests on July 4-5, 1992. Adult and/or juvenile raptors were found to be present in the general vicinity and 4 nest sites were within the project area. Two of these active nests were being used by red-tailed hawks, with signs of nesting activity. The two additional sites were occupied by Northern goshawks, one of which had signs of nesting activities.

Of the remaining 7 nests, attempts to locate 2 of them were not made because of time constraints, 1 was inaccessible and the remaining 4 were unoccupied by raptors and lacked evidence of nesting activities. During the field study additional raptor observations were made including one juvenile and two adult red-tailed hawks, and two goshawks.

During a survey by the USFS in 2002 a goshawk nest was located. The permittee was not given the exact location of the nest but was given an activity exclusion zone of ½ mile radius with the diameter center being the ½ section on the South section line of Section 3, Township 13 South, Range 6 East.

Because no surface disturbance is planned in the North Lease Tract Area, critical habitat for raptors ~~will~~should remain unaffected~~ in the proposed new area~~.

An additional baseline Northern goshawk survey will be conducted in the North Lease area prior to July 1, 2005. Details of the method of the survey are outlined in Appendix A-2, "Biological Studies

in Winter Quarters Canyon Creek and Woods Canyon Creek - A Study Plan". Results of the survey will be provided in Appendix A-2, Volume 2 when completed.

Although minimal cliff habitat exists in the North Lease area, and the likelihood of subsiding those areas even less, Canyon Fuel Company, LLC commits to conducting an additional raptor survey in areas of cliff habitat within one year of undermining the cliff area. Additional annual surveys will be conducted if any nests are located during the baseline survey. The raptor-nest survey will be conducted via helicopter. Results of the survey will be provided in Appendix Volume A-2.

A raptor survey will be performed during 2003, however because no surface disturbance is planned in the North Lease Tract Area, critical habitat for raptors will remain unaffected by the proposed new area.

THREATENED & ENDANGERED SPECIES

Because no surface disturbance in planned for the North Lease Tract Area, no impact to endangered, threatened, or otherwise sensitive species should occur.

Recreation

Recreational use of the lease area affected by surface operations consists primarily of hunting big game, game birds, and small game species; fishing in Eccles Canyon below the portal area; from the south fork to the mouth of the canyon sightseeing, snowmobiling, and cross country skiing. Limited camping and picnicking also occurred in the mouth of Eccles Canyon (U.S. geological Survey, 1979).

Eccles Canyon Road provides the only direct access from Scofield Reservoir to Huntington Canyon and is used as an access route from the Scofield Reservoir recreation area to the recreational use areas at higher elevations in the northern end of the Wasatch Plateau (U.S. Geological Survey, 1979).

Natural Gas Transmission

A natural gas pipeline traverses the permit area from southeast to northwest. ~~The original gas pipeline was abandoned and a new line was relocated in 1990. A gas tank associated with the transmission line is immediately southeast of the permit boundary.~~ Additionally, an abandoned gas well is located in the Eccles Canyon portion of the permit area. A small building associated with Gas Well No. 8 is located in Eccles Canyon. The location of these features are all shown on Map 2.12.1-1.

Forestry

Forest uses are limited primarily to cutting firewood and fenceposts. Occasional timber sales from National Forest lands are made to salvage insect-killed spruce timber. One such sale, totalling 2.5 million board feet, was made in the Kitchen Creek drainage basin on the west side of the coal lease area in 1977.

TBR (Timber) Management Unit - Emphasis is on management for production and use of wood - fiber for a variety of wood products.

UC (Utility Corridor) Management Unit - Emphasis is on providing transportation corridors for major cross-country pipelines, electrical transmission lines and telephone lines. This unit currently contains a gas transmission pipeline constructed and operated under a Forest Service special-use permit issued to Questar Pipeline Company (main line 41).

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RPN (Riparian) Management Unit - Emphasis is on management of riparian areas and all the component ecosystems. The units consist of a zone approximately 100 feet measured horizontally from the edge of all perennial streams and springs, and from the shores of lakes and other still water bodies.

MMA (Minerals Management Area) Management Unit - Emphasis is on making land surface available for existing and potential major mineral developments.

In the "Land and Resource Management Plan" the Forest Service lists specific objectives pertaining to management of resources and resource uses on National Forest System lands. The Forest Service portion of the disturbed area (portal area) is currently identified as a Minerals Management (MMA) Unit. After completion of coal mining activity, the area will revert to a Range (RNG) Management unit.

COMPATIBILITY OF MINING OPERATION WITH FOREST SERVICE MANAGEMENT EMPHASIS AND OBJECTIVES

All mining activities related to the Forest Service "Land and Resource Management Plan" will be coordinated with the appropriate Forest Service personnel prior to implementation. While ~~it is recognized that the fact that~~ the mine is located ~~as it is~~ on the Forest Service land boundary, creating primarily visual and traffic pattern related impacts, these effects are considered to be rather short term and will be essentially eliminated upon mine closure.

ARCHAEOLOGY AND PALEONTOLOGY IMPACTS

State and Federal laws require protection of certain cultural resources. The mining operation is considered compatible with the requirements of all agencies in this area, since to date, there are no known archaeological or paleontological sites within the proposed disturbed areas. Section 2.1.1 and Appendix Volume A-3 contain additional discussion and documentation on these cultural resources.

BUILDINGS, PUBLIC ROADS, AND OTHER MAN-MADE FACILITIES

There are few man-made features located within the Skyline Mine permit area. One abandoned gas well is located within the permit area in Eccles Canyon. The only building located within the permit area is a small structure associated with Gas Well No.8. A natural gas pipeline traverses the permit area and an associated gas tank is located east of the southeastern boundary of the lease area. The location of public roads, including SR-264, within and adjacent to the lease area are illustrated in Map 2.12.1-1. A USGS gauging station was located near the mouth of Eccles Canyon but was removed during the summer of 1985. (See also the reclamation discussion in Part 4.)

CEMETERIES, NATIONAL TRAILS AND WILD RIVERS

There are no cemeteries, national trails, or wild rivers located within or adjacent to the Skyline Mine lease and permit areas.

LAND USE OF THE NORTH LEASE TRACT AREA

The North Lease Tract Area is located north and adjacent to the Skyline Mine. Consequently, the landuse of the North Lease Tract Area is very similar to that described in Section 2.12 for the Skyline property.

The general area of the Skyline property lies within both Carbon and Emery counties, whereas, the North Lease Tract lies only within Carbon County.

Land uses of the areas consist of wildlife habitat, grazing, recreation, natural gas transmission and forestry.

Wildlife Habitat

A listing of wildlife that inhabit the North Tract Area can be found in Section 2.9.5 with additional details about the general mine area in Appendix Volume A-2.

Grazing

National Forest Sheep allotments are maintained in the area. Private lands are grazed by similar numbers of sheep.

Recreation

Recreational use of the area consists primarily of hunting (big game, game birds, and small game species), sightseeing, snowmobiling, and cross country skiing. Limited camping and picnicking also occurs.
9/04/02

Farming

As indicated in the soil section of the North Lease Tract Area, farming in the area is prohibited by the steep and rocky terrain of the area.

Alluvial Valley Fill

Winter Quarters Canyon / Woods Canyon

Minor amounts of Alluvial Valley Fill (AVF) are located in the mouths of Winter Quarters Canyon and Wood Canyon. The AVF determination was based on elevation of mapped alluvial sediments located in Mud Creek, existing surface irrigation ditches located in Woods Canyon, and field observations. In Winter Quarters Canyon the AVF is delineated by mapped alluvial sediments located at the same elevation in the Mud Creek drainage, and surface irrigation ditches that divert water off of Winter Quarters Creek. In Woods Canyon, the AVF is delineated by sediments located in the mouth of the canyon located at the same elevation of the alluvial sediments in the Mud Creek

drainage. A total of 44 acres are located in Winter Quarters Canyon and approximately 3 acres are located in Woods Canyon. The crop grown in both canyons (pasture grass) is not harvested for sale. It is consumed in place by livestock.

Mud Creek

EarthFax (2002) evaluated the erosional stability of the Mud Creek channel from Eccles Creek to the town of Scofield. As part of this evaluation, the channel roughness was determined for selected channel cross-sections using the Manning's methodology. The Manning's 'n' values ranged from

flood, notably greater than the combined flow of the natural runoff plus the mine discharge. Therefore, the field areas adjacent to Mud Creek are not likely to be affected by flooding from the combined flows.

EarthFax (2002) conducted an evaluation of the hydrologic conditions and erosional stability of the channel banks. Based on the combined mine discharge of approximately 10,000 gallons per minute and natural flows, the channel flows at approximately bankfull conditions. Structural stability evaluations using the bank and channel bed samples with the GEOSLOPE computer program demonstrated that the banks are stable and unlikely to fail due to the combined flow in the channel. Erosional stability evaluations using maximum allowable velocity methods for channel, bank, and flood plain, indicated that channel materials, consisting of silty sands and clayey silts and which are well vegetated with various natural grasses and willows, are able to handle the combined flow without significant erosion.

Very little sinuosity of the stream channel exists in both Winter Quarters and Woods Canyons. In Winter Quarters, the channel length measured approximately 10 percent longer than the length of the property, indicating a sinuosity of 1.1. The channel width of Winter Quarters ranges from 6 to 8 feet. Based on visual observation of the creek, the channel is slightly incised and low flow terraces are limited in extent and discontinuous. In most places, no low flow terraces exist at all. The alluvial sediments in Woods Canyon are limited in extent and were not measured.

Stream Flow. The US Geological Survey has been monitoring long-term stream flow on Mud Creek below the Winter Quarters Confluence at Scofield, Utah since 1979. A plot of the daily mean flow is presented in Figure 2.12-C. Although the period of record is 1979 through 2002, a break in the record occurred between 1986 and 1991, during which time no flow data were collected. Flows during the period of record have ranged from a maximum of 389 cfs in May 1984 to a low of 1.6 cfs in January 1980. The periods of high flow generally occur during the spring snow melt period in May through June lasting for a duration of approximately 30 to 45 days. Following the snowmelt period, the stream flow drops gradually to the low flow period which occurs generally during fall and winter months. Some minor short-term events occur, but the duration is generally less than a day and the flows have historically not been greater than the snowmelt events.

In August 2002, EarthFax, as part of an on-going study, installed a series of piezometers at six locations along Mud Creek. The piezometers were located on both sides of the stream to identify the water table and determine the potential for groundwater movement toward or away from the

Therefore, groundwater contributes to the creek flow through the lower portion of the Pleasant Valley. This is further supported by the wetland and spring areas adjacent to the stream identified by Mt. Nebo in Reaches 4 and 5 (Eccles Creek confluence to Scofield Reservoir).

A field study currently underway by EarthFax shows that the lower reaches of Mud Creek are gaining stream flow. This is evidenced by the piezometer water levels being higher than the water surface in the stream(see valley cross sections presented in Attachment 1). Under such conditions, the groundwater flow direction is from the pastures toward the stream. Given the steep slope of the valley bottom toward the stream and the associated relatively steep slopes of the groundwater surface toward the stream, any increase in the water surface of the stream will only raise the potentiometric surface beneath the valley within a relatively small zone adjacent to the stream. Thus, there is no significant potential for the combined flow in the stream channel to increase the groundwater table under a substantial portion of the pastures.

Utilizing the US Geologic Survey stream flow data, the base flow contribution to Mud Creek was estimated. Using the fall and winter data for the early portion of the flow record, before significant mining activity and discharge occurred the base flow for Mud Creek is estimated to range between 1.6 and 5 cfs. The variation in flow is based on the prior year's precipitation, with wet years yielding higher base flows.

Based on the flow readings in the stream channel at MC-1 (18.24 cfs) thru MC-3 (24.44 cfs), the stream flow increases in a downstream direction. While there are some interferences with inflows from contributing surface stream flow and irrigation return flows, the major portion of the increase likely represents base flow contribution. The flow difference between MC-1 and MC-3 is 6.6 cfs. Assuming that approximately 2 to 3 cfs is contributed from the side drainages, the base flow contribution would be on the order of 3 to 4 cfs. This fall is within the range estimated from the US Geologic Survey records.

Stream flow in Winter Quarters, measured quarterly at the western property boundary over the last few years, ranges from 108 to 871 gpm and averages 342 gpm. Stream flow in Woods Canyon, measured quarterly at the mouth of the canyon over the last few years ranges from 23 to 410 gpm, and averages 120 gpm.

Monitoring Plan. In coordination with the Division of Oil, Gas, and Mining, Canyon Fuel has developed a work plan to evaluate mine-water discharge impacts in Mud Creek. The plan requires

TABLE 2.12.3

FARM OWNERSHIP, SIZE, AND YIELD

Land Owner	Crop Grown	Size (ac)	Annual Yield (tons)
Robert Rodakovich, Trust	Pasture Grass	68	170
U.S.A.	Pasture Grass	40	100
Utahna Pace Jones Trust	Pasture Grass	322	805
Fred & Shiela Jensen	Pasture Grass	~~50~~88	~~125~~220
William A. & Mattie Cornaby	Pasture Grass	6	15
Rudman Land and Livestock	Pasture Grass	3	7.5

The crop grown in the subject area (pasture grass) is not harvested for sale. Rather, it is consumed in place by livestock. Therefore, its value must be calculated based on the replacement cost of imported feed if the pasture grass becomes unavailable.

Standard ranching practices suggest that a grazing cow or horse requires approximately 0.75 tons of feed per month while a fed animal requires about 0.5 ton of feed per month. The difference is due to the reduced energy output of an animal that is given its feed versus that which must forage for feed. Based on a cost of $100/ton of hay, and a consumption rate of 0.5 tons per animal per month, the cost of feed ranges from approximately $50 to $75/animal/month.

~~Private landowners are not obligated to provide information or retain records concerning the number of livestock grazed on their property or of the length of time they graze. Observation of grazed property adjacent to Mud Creek in July 2002 showed varying numbers of animals on the individual properties. Table 2.12.4 shows the breakdown of the farm usage.~~

~~TABLE 2.12.4~~

~~FARM GRAZING USAGE~~

~~Land Owner~~	~~Number of Animals~~	~~Required Feed (tons/month)~~	~~Cost to Replace Feed~~
~~Robert Rodakovich, Trust~~	~~20 Cattle, 4 Horses~~	~~12.0~~	~~$1,680~~
~~U.S.A.*~~	~~-~~	~~-~~	~~-~~
~~Utahna Pace Jones Trust *~~	~~25 Cattle~~	~~12.5~~	~~$1,750~~
~~Fred & Shiela Jensen~~	~~65 Cattle, 2 Horses~~	~~33.5~~	~~$4,690~~

~~* Acreage available for grazing for the USA and Utahna Pace Jones parcels varies based on the water elevation of Scofield Reservoir. Most years USA has no grazing land available due to inundation.~~

~~Assuming that Table 12.2.4 represents average grazing usage for the farms, this represents a maximum replacement feed cost of $8,120/month if all pasture production were eliminated. This assumes the unlikely scenario that all pasture grass would be lost.~~

Impacts which may result would be either the loss of production and income as a result of flooding or increased saturation of the root zone. Flooding impacts would occur if the pasture land were inundated for extended periods. Saturation impacts would occur if the water table underlying the pastures were raised for extended periods of the growing season.

Based on the information presented by EarthFax (2002), the flooding potential from the combined flow of natural runoff and mine discharges is very small. The combined flow only reaches bankfull stage and does not reach the top of bank or flood plain areas. Therefore, no flooding impact is expected to the adjacent pastures/farming activities along and adjacent to Mud Creek.

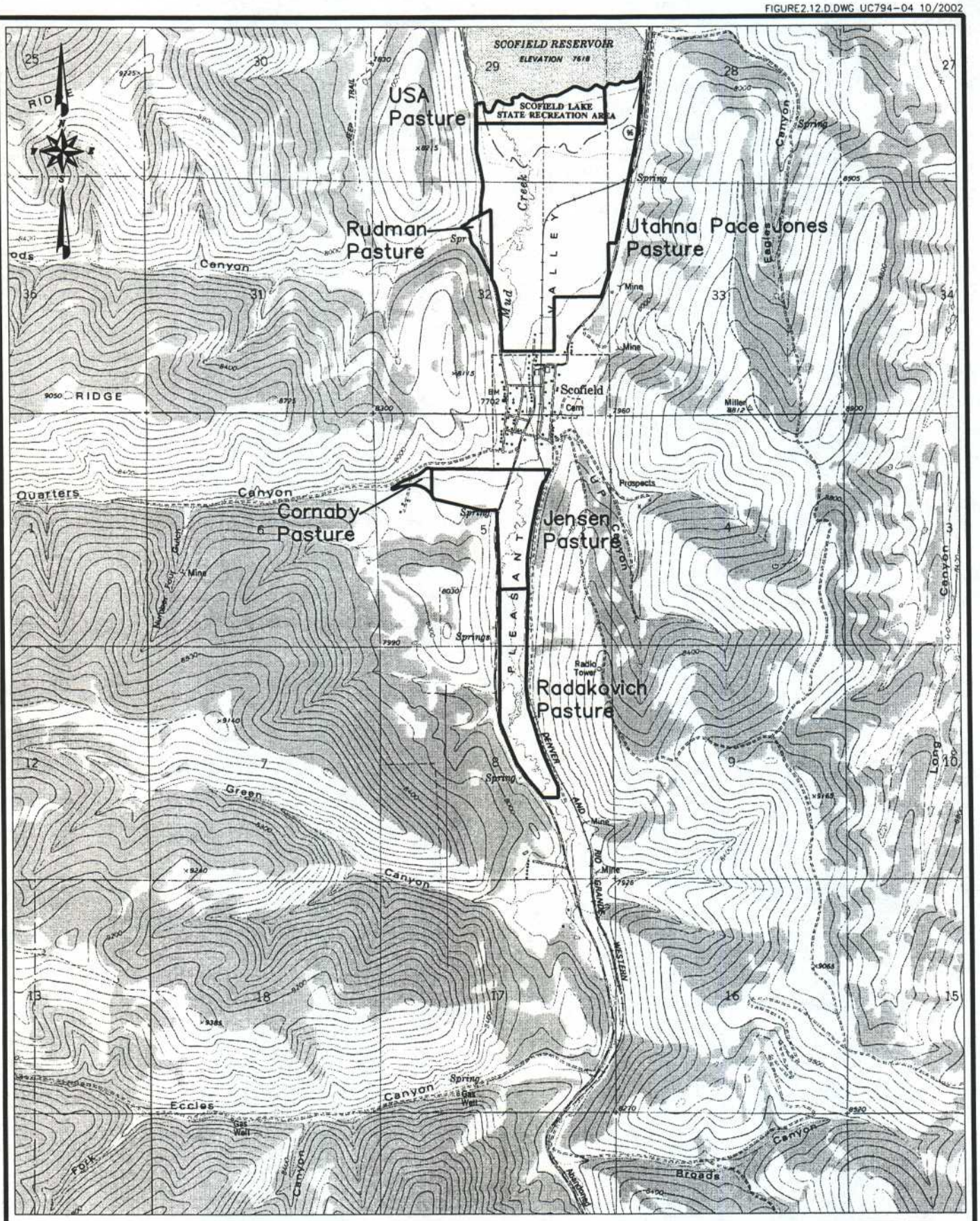

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FIGURE 2.12.D. FARM LOCATION MAP

EarthFax

Main entries in the mines are advanced so that mining panels may be developed on one or both sides. These panels are usually 2,500 to 7,000 feet long and 400 to 800 feet wide. The panels will be mined by driving rooms or by retreat-type operations where coal is mined as Room and Pillar Mining. Where feasible, the coal will be removed by a longwall operation. The panels will then be "pulled" consecutively to the barrier, leaving the main entries intact.

The mains developed to access the North Lease area will be driven through the SW1/4 SW 1/4 of Section 12, Township 13 South, Range 6 East. Multiple entries will be driven north from existing workings within the unsealed southeastern portion of Mine 3 workings (Drawing 3.1.8-2). As the mains approach the north east portion of the abandoned Mine 3 workings, they will be angled downward to go under the abandoned workings instead of through. This portion of Mine 3 was flooded by pumping water from Mine 2 into Mine 3 beginning in March 1999. This pumping continued until August 2002. At that time, the water level in the abandoned Mine 3 was reduced in the abandoned portion of Mine 3 to an elevation below the northeast corner of Mine 3 and at or below the level of the new entries. Removing the water from the abandoned portion of Mine 3 removed the risk of flooding the new entries from water with Mine 3.

The abandoned Winter Quarters Mine workings are illustrated on Drawing 3.1.8-2. The new entries to the North Lease area will be driven at least 300 feet horizontally distant from the closest point in the abandoned Winter Quarters Mine. As required by MSHA, exploratory drilling will be performed at required intervals to ensure Skyline Mine does not intercept the abandoned Winter Quarters Mine.

~~No second mining of the entries driven to the North Lease area will occur. Therefore, not surface subsidence or disturbance is planned or projected into this area.~~

3.1.3 Method of Mining

In order to achieve maximum coal reserve recovery and enhance overall production rates, the mining plan, as developed to date and herein proposed, involves two mining methodologies most appropriate

result of subsidence, the expected maximum amount of subsidence, locations of water rights, and the area where the overburden is 700 feet or less over the mineable coal seam, the Lower O'Connor "A". No buildings, pipelines, or maintained roads were found in the areas to be subsided as a result of implementing the current North Lease mine plan. ~~A poorly maintained pack trail does cross the area in the bottom of Winter Quarters Canyon and on the north side of Bob's Canyon.~~ The only mapped pack trail in the North Lease area runs east-west on the ridge between Winter Quarters Canyon and Woods Canyon, dropping down into Winter Quarters Canyon. The trail is outside the area to be subsided, therefore, no subsidence related impact is anticipated on the trail.

As discussed in detail in Section 2.2 of this M&RP, the rocks in the North Lease area are in compression. The state of compression of the rocks in the North Lease area will likely allow the subsidence forces to be transmitted across fault and fracture planes thus resulting in uniform subsidence. Previous mining in Mine #3, where the rocks are also under compression, did not result in focused subsidence along faults or fractures. Indeed, in the southern portion of the mine permit area where the rocks are subjected to extensional forces, focused subsidence did not take place.
Drilling and field work conducted in the North Lease by Skyline geologist Mr. Mark Bunnell indicates the Castlegate Sandstone in the head of Winter Quarters and Woods Canyons in the permit area consist of two thin sandstone units, separated by slope-forming shale and

siltstone. Because of the thinner, "ledge and slope" nature of the Castlegate in the permit area, the potential for subsidence-induced escarpment failures or landslides is minimal (3/3/05 M.Bunnell memo). As discussed in Section 4.17.3 and illustrated in Drawing 4.17.3-1A, the combination of geology, depth of cover, and mine plan should keep subsidence affects to a minimum. Drawings 4.17.1-1 and 4.17.1-2 illustrate that, if the maximum subsidence does occur, no reduction or significant alteration of the perennial stream flow should occur. This is due primarily to the existing stream gradient, projected worst-case subsidence, depth of cover, and depth of alluvium within the drainage corridor. Although the gradient is reduced in some areas, no significant ponding or over-steepening of the gradient is anticipated. Potential areas of *minor* cracking, as illustrated on Drawing 4.17.3-1A, are primarily a function of the advancement direction of the longwall panel, steepness of slope, and how the bedrock subsides into the void left by longwall mining.

The mine ~~currently has approval to do development mining in the North Lease area from the Forest Service and~~ will not subside any of the perennial streams in the North Lease without approval from the Forest and Division. The Burnout Canyon Study (Appendix A-1, Volume 2), conducted in cooperation with Canyon Fuel Company, LLC, and The Manti-Lasal National Forest, was completed in July 1998. The study was specifically designed as a demonstration for successful undermining of perennial streams. Stream flow measurements taken in Burnout Canyon during and subsequent to the study and compared to flows in drainages outside the permit area also demonstrate any changes in flow in Burnout Creek areas likely related to climatic changes (drought) and not mining activities (DOGM EDI). The stratigraphy, depth of cover, and general dip of the formations in Woods and Winter Quarters Canyons are very similar to Burnout

Canyon. The permittee believes the Burnout Canyon Study can be used to predict the impacts of undermining both Winter Quarters and Woods Canyons and that mining in the North Lease area can be conducted with minimal impacts to perennial streams due to subsidence.

The Forest has indicated that the forest land is considered to have renewable resources related to wildlife and grazing. The timber resources are extremely limited and isolated in this area of the forest and will likely never be harvested (Carter Reed, Manti-La Sal National Forest, Oral Communication 10-2002).

4.17.2 Mining Methods

The mining methods to be used by the Permittee include longwall mining, room and pillar mining with pillar removal, and room and pillar mining with pillars left in place. Certain room and pillar mining systems are designed to provide full support and will prevent subsidence. Subsection 3.1.5 contains descriptions of the mining methods to be implemented.

Revised: 11/04/02

No mining will be conducted beneath Electric Lake.

Full extration mining techniques under the creek buffer zones will only be proposed if evidence shows surface effects, if any, can be mitigated. Full extraction mining techniques and associated mitigation plans must first be approved by the Division/U.S. Forest Service.

Drill holes show that there are clay rich shale layers present which will likely swell into an impervious clay when wet. This characteristic is expected to seal possible subsidence cracks to prevent downward migration of water and subsequent loss of springs and other water sources based on information supplied by Roy Full (Volume A-3) and supported by the Burnout Canyon Study (Appendix 1-A, Vol.2).

Extensive experience with mining-induced subsidence at Skyline Mine indicates the subsidence factor (SF) relative to mining height is as follows:

Overburden 200-500' ~ SF 0.7
Overburden 500-1000' ~ SF 0.5
Overburden 1000-1500' ~ SF 0.3
Overburden 1500-2000' ~ SF 0.15

Approximately 20-30 percent of the planned subsidence will be occurring where overburden thickness ranges from 500 to 1000 ft. and 70-80 percent of the subsidence occurring where overburden thicknesses are greater than 1000 ft(3/3/05 M. Bunnell memo). Given the projected mining thickness is 9-11 feet, and the approximate minimum overburden is 600 feet in the North Lease area, the maximum subsidence anticipated is less than 6 feet. Drawing 4.17.3-1A illustrates most of the subsidence will be in the 2 to 4 ft. range. Areas identified as having 6-feet of subsidence were rounded-upward to provide a six-foot contour line. Six-feet of subsidence is generally a worse-case scenario.

A section of a natural gas pipeline in the Burnout Canyon-Huntington Creek area was decommissioned in October 2000. Its replacement section was constructed in the pre-existing pipeline right-of-way on top of Trough Spring Ridge. Since the Trough Springs Ridge area will not be undermined again and subsidence from previous mining under this area is essentially complete, the Burnout Canyon-Huntington Creek portion of the pipeline is labeled as "old pipeline" on the mine maps and is still owned by Questar. However, it has been decommissioned by Questar to allow undermining by Skyline Mine. The future utilization and status of decommissioned portion of the pipeline is Questar's responsibility.

4.17.4 Mitigation of Subsidence Effects

Surface structures which may be effected by subsidence include the Permittee's buildings and facilities incidental to the coal operation, the natural gas pipeline which crosses the coal lease area, and roads within the area. No additional structures are located within the new UP&L lease area.

Should subsidence damage any of the surface structures despite the planned subsidence prevention measures, the Permittee will arrange for their repair. Any subsidence related damage to SR 264 will be repaired by the Permittee in accordance with the DOT Subsidence Impact Agreement dated July 17, 1989 (see Exhibit 1).

Hydrologic information during a four year period (1984-1989) at the Skyline Mine indicates that there is a reasonably good correlation between the amount of mine water discharged from Mine #3 and the amount of coal mined (see Drawing 4.11.4-A). ~~Our~~The mine water historically encountered in Mine #3 was ~~is being~~ produced from the Blackhawk Formation. Data from ~~our~~ the approved water monitoring program indicate ~~our~~ mine dewatering is not affecting any surface springs or seeps. ~~Our experience is showing that~~ Water monitoring

data suggests the migration of water through the aquifer in Mine #3 is extremely slow to the extent that the water should be considered "perched or trapped water." Since the North Lease mining will be occurring in the area adjacent to the previous Mine #3 workings and under the same geologic environment, similar inflow conditions are anticipated.

If it is determined that subsidence causes material damage or a loss of flow in a perennial stream, the Permittee commits to using the best technology currently available (BTCA)to mitigate the damage. Methods may include backfilling with surrounding native material, incorporating bentonite or other water-retaining native material into the backfill, or possibly even temporarily bypassing/piping flow through impacted areas until mitigation is achieved.

At this point in time it is difficult to suggest ~~any~~specific mitigation of impacts or reclamation on renewable resources that are impacted by undermining, since we can only assume those impacts and their effect. Mitigation measures are site-specific, and ~~Mitigation measures~~ will be contingent upon the findings of the subsidence monitoring program. Subsidence data is available on Drawing 4.17.3-1 and is updated in annual reports submitted to DOGM. Mining in the area has been conducted since 1982, providing over twenty (20) years of subsidence data. As noted in Section 4.17.3 and substantiated within the Burnout Canyon study (Appendix A-1,Volume 2), the amount of subsidence is directly related to surface and subsurface geology and depth of cover. To date, the only areas where mitigation efforts have been implemented are in areas where two-seam mining was conducted. Tension cracks formed in areas where a barrier between panels was present in both seams - effectively creating a 20-foot pedestal. These associated cracks were mitigated by backfilling using a dozer and/or a trackhoe. ~~Surface subsidence experienced to date, as shown in the 1987 and 1988 annual reports, has been less than 50% of the mining height even after 2 years have passed.~~ As data are collected, methods of mitigation will be formulated. This will be done in coordination with appropriate regulatory agencies. Since subsidence may continue to occur after final mining, the monitoring program will continue until it is determined by the Permittee in cooperation with the regulatory agency that it is no longer needed, or subsidence has stopped.

maximum subsidence (S/Smax); 4) the relationship between mining and onset of subsidence and the correspondence between the face advance and subsidence profile development; and 5) the bulking factor.

Table 4.17.5A illustrates subsidence points in both Mine #3 (where single-seam mining has occurred) and Mines #1 and #2 (where two-seam mining has occurred, and compares the anticipated subsidence (Section 4.17.3) with actual subsidence that has occurred. All the subsidence locations used were located where a creek crosses the center of a panel. These sites were used due since there is typically better ground control in a stream channel versus a slope, and the concerns related to subsiding streams.

Table 4.17.5A

Subsidence Location	CalculatedSubsidence	**Actual Subsidence**
Mine#3, panel 7R	4.8-ft	5-ft
Mine#3, panel R6	1.95-ft	2-ft
Mine#3, panel 6R	3.9-ft	4-5-ft
Mine#3, panel R5	3.9-ft	4-ft
Mine#3, Panel R4	3.9-ft	3-ft
Mine#2/1, pan. 6L/7L	11.5-ft	12-ft
Mine#2/1, pan. 5L/6L	14-ft	12-ft
Mine#2/1, pan.	12-ft	12-ft

4L/5L		
Mine#2, panel 11L	6-ft	6-ft
Mine#2, panel 8L	6-ft	6-ft

Table 4.17.5B cites examples of the maximum extent of subsidence observed at specific sites within the Skyline Mine permit area.

Table 4.17.5B

Subsidence Location	Subsidence Buffer Angle	Actual Maximum Extent of Subsidence
Mine#3 Panel 7R	22°	18°
Mine#2 Panel 9L	22°	20.5°
Mine #2 Panel 11L	22°	22°

It is important to understand the points of zero subsidence used to calculate the angle of draw are somewhat subjective due to the accuracy of the survey method. The points of zero subsidence used in these calculations are very conservative, potentially resulting in a greater angle of draw than actually may exist.

~~A special three year subsidence monitoring program will be conducted to study the general effects of subsidence related to full extraction coal mining on flows in the upper reaches of Upper Huntington Creek and Burnout Creek drainages.~~

The following monitoring program was initiated as part of the Burnout Canyon Study: ~~The monitoring program will proceed as follows:~~

BIOLOGICAL STUDIES IN

WINTER QUARTERS CANYON CREEK
&
WOODS CANYON CREEK

A Study Plan

Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
Springville, Utah 84663
(801) 489-6937

Patrick D. Collins, Ph.D.

for

CANYON FUEL COMPANY, LLC.
Skyline Mines
HC 35 Box 380
Helper, Utah 84526

May 9, 2005

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RIPARIAN VEGETATION STUDIES

INTRODUCTION

Because underground coal mining is planned for the future underneath perennial streams, a study will be performed that concentrates on the riparian plant communities in Winter Quarters Canyon and Woods Canyon.

A variety of biological and other resource data can be gathered to evaluate and characterize riparian complexes including vegetation, geology, channel morphology, aquatic biology, soils, and stream flow. The primary focus of this study will be on the riparian vegetation. The data recorded will provide baseline and followup information by monitoring the riparian communities of the creeks. Regular monitoring should provide data to determine long term trends, natural variability and benchmark information including the possible impacts on the riparian plant communities from mining under the creeks.

The design of this study will not provide data that shows subtle changes to plant community structure and species composition as a result of *minor* changes to the riparian habitat. Rather, the study has been designed to be compared with subsequent years in an attempt to document *major* impacts to the plant communities along the streams in the case of catastrophic events, such as loss of water and habitat from the effects of subsidence caused from underground mining.

METHODS

The riparian vegetation of all perennial stretches in Winter Quarters Canyon and Woods Canyon including their tributaries will be surveyed. The surveys will be conducted during the growing season each year, most likely during the months of July and August. The vegetation monitoring methods of the studies have been primarily based on those described by the USDA Forest Service for a "*Level III Riparian Area Evaluation*" (Integrated Riparian Evaluation Guide, March 1992). Qualitative and quantitative data will recorded at each sample station location.

Sample Placement & Frequency

The goal of the study plan is to begin with one complete baseline data set for all riparian areas near the perennial streams in the permit area on the same year (the first year of study). For subsequent years, sample station locations will be pre-determined and mapped based on time of proposed underground mining activities. Sample frequency will be intensified in those areas where: 1) underground mining is planned for the near future, 2) where mining is currently occurring, and 3) where mining has occurred in

the recent past. Although subject to modification, the proposed sample frequency and placement have been described below.

Baseline Year: During the first study year, a Level III Survey will be conducted on all perennial streams and tributaries of Winter Quarters Creek and Woods Creek that are located in the permit area. The sample locations will be placed at regularly spaced intervals, or approximately every 800 ft over the areas – *with the exception of those areas where underground mining will initially begin* (see below). In addition, other areas, possibly outside the permit area, will be surveyed for use as potential "control sites". In other words, other comparable riparian areas may be chosen that could be monitored for changes over time along with the areas where subsidence from mining is possible.

Subsequent Years: In those years that follow the *Baseline Year* described above, the riparian vegetation surveys will concentrate on the mine or mined areas. Or, in the areas where mining activities are planned under the streams, riparian sampling will be conducted: 1) two years prior to mining these areas, 2) the year of the mining activities, and 3) two years after mining has occurred in those areas. During these study periods, sample stations will be placed at regular intervals every 400 ft.

Line transects will be placed at each station location. Locations and extent of the transects will be semi-permanently marked using numbered and flagged wooden stakes and 12-inch metal nails.

Geomorphological stream channel data outlined in the Level III protocol with not be recorded because Canyon Fuel Company has done other studies that will suffice for this information.

Qualitative Data

The "Riparian Complex Data Sheet" shown on this

RIPARIAN COMPLEX DATA SHEET

CLIENT:
COMPLEX: Riverine - Number
WATERBODY NAME:
LOCATION:
DATE:
OBSERVER(S):
QUAD NAME:
GEOLOGIC PARENT MATERIAL:
ASPECT:
VALLEY BOTTOM TYPE:
STREAM GRADIENT:
ELEVATION: .
SIZE OF COMPLEX:
SOILS INFORMATION:
ADJACENT UPLAND VEGETATION (looking downstream)
Left: Right:
VEGETATIVE DESCRIPTION (Dominance by Community Types)
SUCCESSIONAL STATUS:
APPARENT FORAGE TREND:
ESTIMATED FORAGE PRODUCTION:
BEAVER ACTIVITY:
PHOTOGRAPH TAKEN: (from right side unless otherwise stated)
LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA:
SPECIES OBSERVED:
POOL ATTRIBUTES
% area in pools:
% pool area made up of pools > 2' deep:
AQUATIC VEGETATION
% streambed with filamentous algae:
% stream margin with rooted aquatic:
BANK TYPE & VEGETATION OVERHANG
% bank length undercut (<90°):
% bank length gently sloping (>135°):
% bank length with overhanging vegetation:
BANK CONDITION (bankfull area only)
% bank length vegetated, stable:
% bank length unvegetated, stable:
% bank length vegetated, unstable:
% bank length unvegetated, unstable:
BANK STABILITY (near water line):
CHANNEL MORPHOLOGY
NOTES:

page lists all of the qualitative data (and some of the quantitative data) that will be collected at each sample station station.

Photographic stations for documentation and future comparisons will also be established at each sample location. A sample location map will be provided in the final report.

Quantitative Data

As mentioned previously, USFS protocol will be utilized for the study.

Community Type Cover - The Community Type Cover is one method to record cover in the USFS Level III protocol. At the sample locations transects lines will be placed across (or perpendicular to) the stream channel. By design, the line transects may vary in lengths which will be based on several factors. Although sometimes limited by topographical features such as cliffs, the intent will be to make the transects long enough to cover the entire stream, its riparian communities, plus an additional 10 ft on each side of the stream to record the adjacent upland communities. Monitoring the total extent of the riparian plant communities including some upland community data should provide information about possible increases or decreases in the riparian communities relative to the adjacent upland communities.

Once the transect is placed, the line-intercept method will be employed measuring the extent of each major riparian plant community. The plant communities will named by the dominant two plant species. If only one species dominates the community by a wide margin, the plant community will be named by this single species.

AMPHIBIAN STUDIES

INTRODUCTION

These studies will be concentrated on the riparian and wetland habitats associated with Winter Quarters Canyon and Woods Canyon creeks. All activities associated with this project will be in compliance with all State and Federal policies and regulations. It is anticipated that no federally listed species occur within the project area, however, the potential for State of Utah species of special concern occurring with the project area does exist. Currently, the State of Utah has regulations regarding the collection and possession of zoological animals (R657-3) and requires that a Certificate of Registration (COR) be obtained prior to any collection activities. Since no collection of controlled species will be implemented as part of this project, a valid COR will not be necessary from the State of Utah, Division of Wildlife Resources prior to implementation of this project.

The general goal of area-based surveys is to sample for the target species that occur in all habitats or areas within the survey area. Techniques used for surveying target species will focus on methods suitable for these species. For the most part, the field techniques are methods of general observation as historically practiced by biologists. Typically, they involve searching for organisms in all possible microhabitats during the appropriate season and time of day. The general approach used for conducting this survey will be based on short-term, time-constrained visual encounter surveys (VES's). Specific methodologies used are described below. All methods for sampling the project area will be consistent with protocols and methods established by Heyer et al 1994, Corn and Bury 1990, and the State of Utah, Division of Wildlife Resources standard protocols established spotted frog and boreal toad.

METHODS

Spotted Frog Survey

Typically VES's and audio strip transects (AST's) are used to determine presence of amphibians during peak breeding activity periods. For spotted frog (*Rana lutienventris*) populations in Utah this period can occur from mid-March through late-April depending on weather conditions and elevation. Since the elevation of the survey area is between 8000 and 9000 feet, it is anticipated that surveys will be conducted in late April or early May. Peak breeding activity of other high elevation spotted frog populations (e.g. Wasatch County) will be used to target survey dates within the survey area. VES's will be conducted along the stream within a 25-30-meter corridor. All amphibian species and lifestages observed will be identified and recorded.

Boreal Toad Survey

VES's will also be used to determine presence of boreal toad (*Bufo boreas*) within the survey area during peak breeding activity periods. For boreal toad populations in Utah this period can occur from early- May through mid-July depending on weather conditions and elevation. Surveys will initially be targeted for early June since the elevation of the survey area is between 8000 and 9000 feet. Peak breeding activity of other boreal toad populations will be used to better determine survey dates within the survey area. VES's will be conducted along the streams within a 25-30-meter corridor. All amphibian species and lifestages observed will be identified and recorded. In addition, one to two night surveys may be conducted if suitable habitat is available for breeding. VES's (with flashlights) and AST's will be used for night surveys if deemed necessary.

Voucher Specimens/Verification

No voucher specimens will be collected as part of this project, however photographs will be taken of any amphibians observed within the project area.

LITERATURE CITED

Corn P.S. and R.B. Bury. 1990. Sampling methods for terrestrial amphibians and reptiles. U.S. Department of Agriculture, Forest Service, General Technical Report PHW-GTR-256,

Heyer, W.R. M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and Monitoring Biological Diversity. Standard methods for amphibians. Smithsonian Institute. 364 pp.

MACROINVERTEBRATE STUDIES

INTRODUCTION

Macroinvertebrate sampling has been conducted in the spring and fall in Winter Quarters Canyon and Woods Canyon by *Mt. Nebo Scientific, Inc.* since October 2002. These studies will be continued in the future using the same sample stations and methodologies as the previous studies. The previous study methods and locations are described below.

METHODS

Sample placement was determined by examination of the stream systems on USGS 7.5 minute quadrangles. Two to three reaches were examined on each stream, with each reach being defined by the inflow of a side stream and the general distance from the previous reach. The lowest reaches in the two streams were established on U. S. Forest Service land above the boundary with private grazing lands. The location of each reach is given in Table 1. Four riffles were sampled within each reach in the fall of 2002, but this was increased to 8 riffles by the spring of 2004. Two samples were taken at each riffle and were bulked together in the field.

Table 1. Location of reach stations on each stream.

Canyon	Reach	GPS coordinates	Elevation
Woods	Upper	N 39° 44.340' W 111° 13.471' UTM4398045 12S0480808	2609 m (8560 ft)
Woods	Lower	N 39° 44.071' W 111° 12.592'	2552 m (8374 ft)
Winter Quarters	Upper	N 39° 42.763' W 111° 13.907'	2587 m (8488 ft)
Winter Quarters	Middle	N 39° 42.933' W 111° 13.378'	2571 m (8434 ft)
Winter Quarters	Lower	N 39° 43.126' W 111° 12.807'	2519 m (8265 ft)

Physical characteristics for each reach have been recorded. These included pH, conductivity, in micro-Siemens/cm (uS/cm), alkalinity, and hardness. Alkalinity and hardness were measured with a Hach water chemistry kit. Slope was recorded with an inclinometer, across a 100 meter length of stream,

beginning at the first (starting downstream) riffle. The stream channel within each reach was characterized by measuring the width, depth, and velocity of the stream every five meters, beginning with the first riffle. Three depth and velocity measures were taken at each five meter interval, these being at the center and approximately 10% of the width from either shore.

Quantitative invertebrate samples were taken with a modified box sampler (Shiozawa 1986) using a capture net with a net mesh of 253 microns. Samples were taken from each of the three reaches in Winter Quarters Canyon and the two reaches in Woods Canyon. Samples were concentrated in the field in sieves with 63 micron mesh, preserved with ethyl alcohol, and were returned to the laboratory for processing. In the laboratory the samples were sorted in an illuminated pan. Organisms were identified to the lowest taxonomic unit possible. Small specimens and those of questionable identity were further examined under magnification. Identification was based on the keys of Merritt and Cummins (1994). The mean values for each taxon were used to determine the density of invertebrates per square meter. Standing crop was estimated from wet weights of total invertebrates collected at the station.

The USFS Biotic Condition Index (Winget and Mangum 1979) was calculated with the community tolerance quotient (CTQa). The predicted community tolerance quotient (CTQp), based on water chemistry data provided in Winget (1972) for the Huntington Creek drainage, is 80. Diversity was calculated for each reach using the Shannon-Weiner index (Pielou 1977). Diversity indices take the number of taxa and their individual densities into account, generating a single value for each station. The greater the number of species or taxa and generally the more even the distribution of densities between taxa, the higher the diversity index value.

Cluster analysis was run with NTSYS-pc (Rolf 2000), using the Bray-Curtis dissimilarity index with the UPGM clustering algorithm. Data from all reaches for the first two sampling periods (fall 2002 and spring 2003) and from both Woods Canyon Creek and Winter Quarters Canyon Creek were included in the cluster analysis.

Since these samples are to be used to establish pre-mining base-line information, the most important information for future assessment will be the actual densities and taxa lists. The CTQa, diversity indices, and cluster analysis will serve to help understand relative associations between the two streams, seasonality effects, and within stream trends. As with all field collected data, annual variations in weather patterns (e.g. the recent drought in Utah) will need to be taken into account in interpreting the data.

LITERATURE CITED

Merritt, R. W. and K. W. Cummins. (eds.) 1996. An Introduction to the Aquatic Insects of North America. Kendall/Hunt Publishing Co. Dubuque, Iowa. 862pp.

Pielou, E. C. 1977. Mathematical Ecology. John Wiley and Sons. NY, NY. 385 pp.

Rolf, F. J. 2000. NTSpc: Numerical taxonomy and multivariate analysis system. Version 2.1. Exeter Software. Setauket, NY.

Shiozawa, D. K. 1986. The seasonal community structure and drift of microcrustaceans in Valley Creek, Minnesota. Canadian Journal of Zoology 64: 1655-1664.

Winget, R. N. 1972. Aquatic environmental impact study of Huntington Canyon generating station and Electric lake. Annual Report No. 2. Center for Environmental Studies. Brigham Young University.

NORTHERN GOSHAWK SURVEY

INTRODUCTION

The Northern Goshawk *(Accipiter gentilis)* in the western United States has been proposed for addition to the USFWS species list in the threatened category several times in the last decade, but the USFWS has consistently decided that the status of the species does not yet warrant such protection. Nevertheless, the USDA Forest Service in Utah lists Northern Goshawk as a sensitive, special status species and requires general presence-absence surveys for it in areas adjacent to proposed development projects. The purpose of this survey will be to determine if goshawks are present in the study areas of Winter Quarters Canyon and Woods Canyon.

Areas of potentially suitable nesting habitat for Northern Goshawk typically consist of coniferous forest and mixed-aspen forest types dominated by spruce, fir, pine, and aspen (Squires and Reynolds, 1997). Winter Quarters Canyon and Woods Canyon have some of these habitats. The standardized inventory and monitoring protocols developed by Kennedy and Stahlecker (1993) and Joy et al. (1994) and adopted by the Forest Service in Utah were used to conduct surveys for nesting Northern Goshawks.

The surveys will be conducted by a professional wildlife ecologist with over13 years experience. He has conducted goshawk surveys in both the Manti-La Sal and Uinta National forests as well as in Devil Canyon just outside of Monticello, Utah.

METHODS

The surveys will be conducted prior to July 1st by broadcasting playback recordings of kecking calls from stations approximately 300 meters apart in the study area between dawn and approximately midday. The observer will wait quietly at each broadcast station for one minute before initiating broadcasts of Northern Goshawk calls for 30 seconds, then repeating 10 seconds of calls for each 30 second interval (at least one in each of the four cardinal directions) thereafter for three minutes. The observer will then remain silent and scan for flying, silently responding, Northern Goshawks for one additional minute before moving on to the next station. The calling stations will be plotted on a map with the use of a GPS system. The boundaries for the calling station will be plotted with a 200 meter buffer although the calls probably travel in excess of 300 meters.

LITERATURE CITED

Joy, S.M., R.T. Reynolds, and D.G. Leslie. 1994. Northern Goshawk broadcast surveys: hawk response variables and survey costs. Studies in Avian Biology 16:24-30.

Kennedy, P.L., and D.W. Stahlecker. 1993. Responsiveness of nesting Northern Goshawks to taped broadcasts of three conspecific calls. Journal of Wildlife Management 57:249-257.

Squires, J.R., and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). *In* The Birds of North America, No. 298 (A. Poole and F. Gills, eds.). The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, D.C.

NORTHERN THREE-TOED WOODPECKER

INTRODUCTION

The Northern three-toed woodpecker (*Picoides tridactylus*) breeds in wooded regions from central Alaska east to Newfoundland and south to southern Oregon and central Arizona in the west, northeastern Minnesota, northern New England in the east. This species typically exists in northern coniferous forest and mixed-aspen forest types dominated by spruce, fir, pine, and aspen (Bull et al., 1986). Its preferred habitat are coniferous forests where they often choose dead trees for cavity nests. The three-toed woodpecker is a rare permanent species in Utah and is classified as a "sensitive species" in the Intermountain Region of the USDA Forest Service, and as a "species of concern" by the Utah State Division of Wildlife Resources.

METHODS

Areas of potentially suitable nesting habitat for the Northern three-toed woodpecker will be surveyed in the project area. A preliminary standardized inventory and monitoring protocol developed by Toone and Howe (undated) will be used to conduct a "General Inventory".

Surveys will be designed to coincide with the period of nest-excavation, when this species is most likely to respond to playbacks of territorial drumming (Goggan et al., 1988). For a survey with an elevation of 8,000 - 8,500 ft in Utah, this time period is estimated to be near the end of May (Toone and Howe, undated). Biologists will walk the project area and stop approximately every 300 meters to broadcast playback recordings of three-toed woodpecker's territorial drumming sounds using portable loudspeakers. Each calling period will last approximately eight minutes, with playback and listening time occurring at about 30 second intervals in each of the four cardinal directions. If territorial drumming is detected in apparent response to the playback recording, observers will try to visually confirm the species identification and then locate the nest site.

LITERATURE CITED

Bull, E.L., S.R Peterson and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northwestern Oregon. USDA Forest Service, Resource Note PNW-444.

Goggan, R., R.D. Dixon, and L.C. Seminara. 1988. Habitat use by Three-toed and Black-backed Woodpeckers. Report 87-3-02, Oregon Department of Fish and Wildlife, Portland.

Toone, R., and F. Howe. Undated. Northern three-toed woodpecker (*Picoides tridactylus dorsalis*) inventory protocol. Draft Report, Utah Department of Wildlife Resources, Salt Lake City.