



**Canyon Fuel
Company, LLC.
Skyline Mine**

A Subsidiary of Arch Western Bituminous Group, LLC.

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March 27, 2011

**Mr. Daron R. Haddock
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801**

RE: 2011 Annual Report, Canyon Fuel Company, LLC, Skyline Mine, C/007/005,

Dear Mr. Haddock:

Please find enclosed with this letter a compact disc (CD) containing all the information required for submittal in the Annual Report. A total of three (3) maps were submitted both on the CD and in hard copy due to professional certifications of said maps.

If you have any questions, please call me at (435) 448-2636.

Sincerely,

A handwritten signature in blue ink that reads "Gregg A. Galecki".

**Gregg A. Galecki
Environmental Engineer, Skyline Mine
Canyon Fuel Company, LLC
enclosures**

RIPARIAN PLANT COMMUNITY
MONITORING REPORT FOR
SELECTED REACHES IN
WINTER QUARTERS CANYON
2011

AT THE
SKYLINE MINE
CARBON COUNTY, UTAH



Prepared by

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by

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for

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Skyline Mines
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March 2012

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Introduction

History and Study Objectives

As described in the preceding reports regarding the riparian communities in the area, coal mining activities are currently being conducted at the Skyline Mine in Carbon County, Utah. Some of the mining occurs underneath Winter Quarters Canyon and its tributaries. As a means to monitor impacts from mining to the riparian plant communities supported along the stream-sides in Winter Quarters Canyon, baseline and yearly studies have been, and will continue to be, conducted. This report describes the results for the 2011 monitoring study in the riparian communities there.

The vegetation monitoring studies have been conducted before, during and after the mining operations. The first such study began in 2005 with the objective to provide a comprehensive baseline dataset of representative stream reaches for the *entire area* in Winter Quarters Canyon and Woods Canyon, or those areas that could potentially be impacted by the proposed underground mining activities. The 2005 monitoring year has been called the *Initial Baseline Year* for the riparian studies of the area.

Regular vegetation monitoring in the riparian zones should provide data to determine long-term trends, natural variability and benchmark information including the possible impacts to the riparian plant communities caused by mining under the creeks and streams of the canyons. The studies have been designed so that the sample frequency is intensified in the areas where: 1) underground mining is planned for the near future (for more baseline data), 2)

where mining is currently occurring, and 3) where mining has occurred in the recent past.

The methodologies used in the studies have been consistent for all monitoring periods. They were not designed to provide data that could show *subtle* changes to community structure and species composition as a result of minor changes to the riparian habitat (which can occur as a result of several factors i.e. precipitation changes). Rather, the studies were designed to be compared with future monitoring studies in an attempt to document *major* impacts to the plant communities along the stream due to catastrophic events, such as loss of water and habitat from the effects of subsidence caused from underground mining.

The Study Areas

Winter Quarters Canyon is located within the Wasatch Plateau, a high plateau that lies between the Colorado Plateau and Great Basin regions of the western United States. The canyon is located approximately 3 miles west of the town of Scofield, Utah. The study areas of Winter Quarters Canyon (and Woods Canyon) are located within the Manti-La Sal National Forest.

Geologically, most of the area is Cretaceous in age with formations present that include the Price River, North Horn, and Blackhawk formations. The dominant plant communities of these canyons were riparian, spruce-fir, aspen/grass, sagebrush/grass and mountain herblands.

Methods

Sample Design, Transect Placement & Frequency

The riparian vegetation of specific reaches in Winter Quarters Canyon were sampled in August 2011. Selection of the sample locations of the reaches were based on the underground coal mining schedule of the Skyline Mines. Like 2006 - 2010, the methods for 2011 follow the *Initial Baseline Year (2005)* described above. The riparian vegetation surveys have been designed to concentrate on recently mined areas, current mining, and areas to be mined in the near future. More specifically, the surveys have been conducted where mining activities are planned under the streams according to the following schedule: 1) two years prior to mining specific areas, 2) the year of the mining activities, and 3) two years after mining has occurred in the areas. During these study periods, sampling will be intensified by placing sample stations at regular intervals every 400 ft., rather than the 800 ft. spacing that was used in the *Baseline Year (2005)*.

[NOTE: *In the Initial Baseline Year (2005) sample locations were placed every 800 ft with the exception of those areas that were scheduled to be mined in late-2005, where the 400 ft spacing was used. Because of the spacing differences and because the underground mining progress determines where transects will be placed each year, sometimes the site numbers in each sample area are not in sequential order].*

Line transects were placed at each sample station. Locations and extent of the transects were semi-permanently marked using numbered and flagged wooden stakes and 12-inch metal rods. The vegetation monitoring methods of

the studies have been primarily based on those described by the USDA Forest Service manual for a "Level III Riparian Area Evaluation" (Integrated Riparian Evaluation Guide, March 1992). Qualitative and quantitative data were recorded at the sample stations established in the field. In the first year of the studies, the overall objective of the study plan was to begin monitoring years with one complete baseline dataset for all riparian areas near the perennial streams located in the mine permit area prior to any mining. As mentioned, in the subsequent monitoring years, sample station locations have been determined and mapped based on the time period schedule for the proposed underground mining activities.

Geomorphological stream channel data outlined in the Forest Service protocol were not recorded as part of this study because Canyon Fuel Company has conducted other studies that will suffice for this information. Additionally, soils information through the Natural Resources Conservation Service (NRCS) were not available for the study areas.

TABLE 1: RIPARIAN COMPLEX DATA SHEET	
CLIENT:	
COMPLEX:	Riverine - Number
WATERBODY NAME:	
LOCATION:	
DATE:	
OBSERVER(S):	
QUAD NAME:	
GEOLOGIC PARENT MATERIAL:	
ASPECT:	
STREAM GRADIENT:	
ELEVATION:	
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:	
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:
NOTES:	
QUANTITATIVE DATA SUMMARY:	
PHOTOGRAPHIC DOCUMENTATION:	

Qualitative Data

The "Riparian Complex Data Sheet" shown on Table 1 lists all of the qualitative and quantitative data that has been, and will continue to be, collected in the future at each sample station.

Photographic stations for documentation and future comparisons have also been established at each sample location. A sample location map has been included in this report.

Quantitative Data

USDA Forest Service protocol was employed as a model to drive the study plan for quantitative data. *Community Type Cover* is one method to record cover in the Forest Service Level III protocol. At the sample locations, transect lines have been placed across (or perpendicular to) the stream channel. By design, the line transects vary in lengths which are based on several factors. Although sometimes limited by topographical features, the intent was 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 transects were placed, the line-intercept method was employed to measure the extent of each major riparian plant community. The plant communities have been named by the dominant two plant species. If only one

species dominates the community by a wide margin, the plant community was named by this single species. In this report, when reference is made to the left or right side of the drainage, this means “river left” or “river right”, as characterized by looking downstream.

Results & Discussion

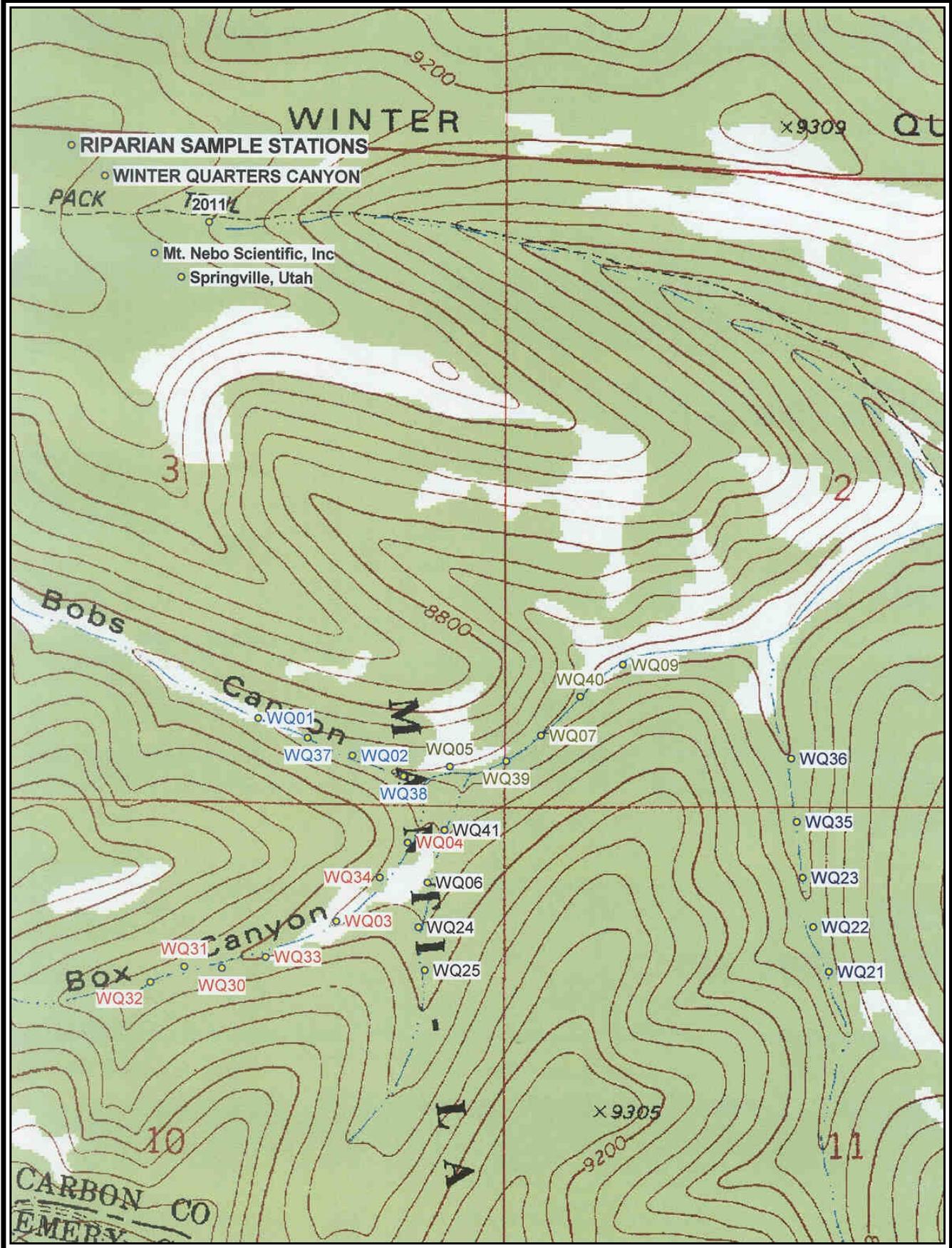
Listed below is a summary of the sample stations for the study areas in 2011 (Table 2). For a map of the locations, refer to the *Sample Station Locations for 2011 in Winter Quarters Canyon* in this report.

TABLE 2: Riparian Sample Stations in Winter Quarters Canyon: 2011

Section 11 Drainage	No-Name Drainage	Box Canyon	Bob's Canyon	WINTER QUARTERS CREEK
WQ-21	WQ-25	WQ-32	WQ-01	WQ-05
WQ-22	WQ-24	WQ-31	WQ-37	WQ-39
WQ-23	WQ-06	WQ-30	WQ-02	WQ-07
WQ-35	WQ-41*	WQ-33	WQ-38	WQ-40
WQ-36		WQ-03		WQ-09
		WQ-34		
		WQ-04		

* New sample site in 2011

Sample results are shown for each site on the data sheets provided in this report. Each sheet shows all qualitative and quantitative data recorded as well as was photographic documentation.



**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-21

WATERBODY NAME: Winter Quarters Canyon Creek (Section 11 tributary)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3°

ELEVATION: 8,560 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Open/Spruce/Aspen

Right: Open to Aspen

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 400 lbs/acre

BEAVER ACTIVITY: Historical use lower in canyon.

PHOTOGRAPH TAKEN: **Yes**

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: **Mining, grazing, hunting, recreation.**

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Symphoricarpos oreophilus</i>	<i>Aster sp.</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Epilobium sp.</i>	<i>Carex hoodii</i>
		<i>Equisetum arvense</i>	<i>Elymus canadensis</i>
		<i>Helianthella uniflora</i>	
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	

POOL ATTRIBUTES

% area in pools: 25
% pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
% stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): **Right side 100%**
% bank length gently sloping (>135°): **50 left side**
% bank length with overhanging vegetation: 0

BANK CONDITION

% bank length vegetated, stable: 85
% bank length unvegetated, stable: 15
% bank length vegetated, unstable: 0
% bank length unvegetated, unstable: 0

NOTES:

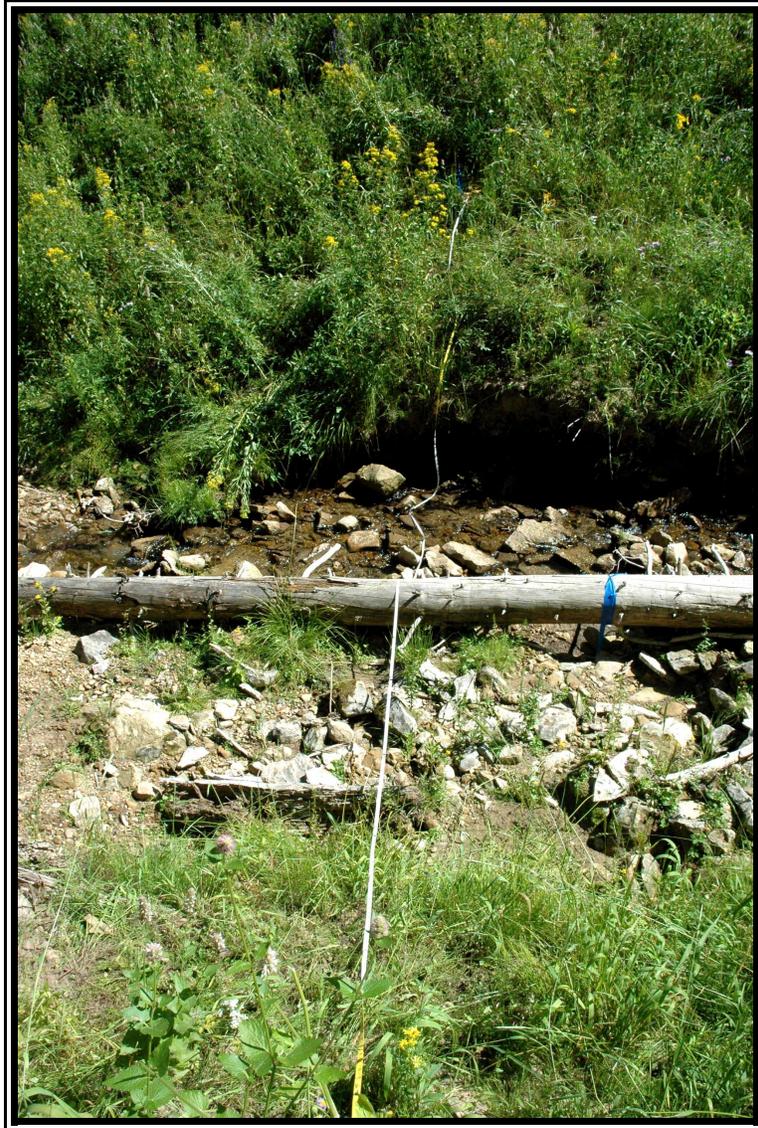
- 1) This statement was made previous year (2010) : "Good study site - there was an obvious transition from stream riparian to upland. The riparian zone here was wider than up- or down-stream".
- 2) In 2011, however, high water and flooding greatly impacted the site, cutting the right bank and redirecting the stream to that side. This flooding took out most of the riparian community (compare 2010 photograph with 2011).
- 3) Site was located in a flatter area that previously held the riparian species well.
- 4) Total transect length measurement has decreased each year, or 37 ft (2006), 36 ft (2007), 35 ft (2008) and 32 ft (2009), 31 ft (2010); 31 ft (2011)
- 5) Logs and litter in stream (see photo).
- 6) Good and constant water flow here.
- 7) Fieldworker got stung by a fat black bee here this year.

DATA SUMMARY

WQ-21: Cover by community types in Winter Quarters Canyon (2011).

UPLAND VEGETATION	Cover (ft)
	4.00
	8.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Geranium richardsonii</i> <i>Carex hoodii</i>	4.00
<hr/>	
TOTAL COVER (Upland Species)	12.00
TOTAL COVER (Riparian Species)	4.00
ROCK (channel)	8.00
WATER (channel)	4.00
BAREGROUND (channel)	2.00
LITTER	1.00
MOSS	0.00
<hr/>	
TOTAL COVER	31.00

PHOTOGRAPHIC DOCUMENTATION



WQ-21

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-22

WATERBODY NAME: Winter Quarters Canyon Creek (Section 11 tributary)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3°

ELEVATION: 8,527 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Spruce/Aspen

Right: Open to Aspen

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Invader species

APPARENT FORAGE TREND: Decreasing

ESTIMATED FORAGE PRODUCTION: 700 lbs/acre on left side; 0 on right.

BEAVER ACTIVITY: Historical use lower in canyon

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Ribes</i>	<i>Geranium richardsonii</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Helianthella uniflora</i>	<i>Elymus canadensis</i>
		<i>Senecio serra</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 50

% pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0

% stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 0

% bank length gently sloping (>135°): 100

% bank length with overhanging vegetation: 5

BANK CONDITION

% bank length vegetated, stable: 90 on left; 5 on right side; average 45.

% bank length unvegetated, stable: 5

% bank length vegetated, unstable: 0

% bank length unvegetated, unstable: 5 on left; 90 on right; average 45.

NOTES:

1) There was a wide riparian area on the left side.

2) Previously, it was difficult to tell where the stream water or the hillside water influenced the riparian plants, but the right side has had an active mud flow from the hillside the past few years and has basically taken out the riparian vegetation there. On the left side, this was an riparian area of about 5.5 ft (refer to data).

3) There were riparian spp. at higher elevations where I considered it was more upland.

4) Like in 2010, the mud slide took the stake on the right side. Again, we placed a new stake at previous distance, or 41 ft. The sliding seems to have somewhat redirected the stream at this site.

5) Species diversity has decrease at this site.

6) Beware: We were attacked by wasps from a gray hanging hive at this site in 2008. It was not seen in 2009, 2010 or 2011 but wasps stung in previous year further downstream in the old spring area (WQ-36).

DATA SUMMARY

WQ-22: Cover by community types in Winter Quarters Canyon (2011).

UPLAND VEGETATION	Cover (ft)
	1.00
	14.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Equisetum arvense/Elymus canadensis</i>	5.50
TOTAL COVER (Upland Species)	15.00
TOTAL COVER (Riparian Species)	5.50
ROCK (channel)	1.50
WATER (channel)	7.00
BAREGROUND (channel)	12.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	41.00

PHOTOGRAPHIC DOCUMENTATION



WQ-22

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-23

WATERBODY NAME: Winter Quarters Canyon Creek (Section 11 tributary)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3°

ELEVATION: 8,481 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Spruce/Fir Right: Open to Aspen

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 500 lbs/acre

BEAVER ACTIVITY: Historical use lower in canyon

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: Mining, grazing, hunting, recreation.

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Delphinium nelsonii</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Equisetum arvense</i>	<i>Carex hoodii</i>
		<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Senecio serra</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 50
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 0
 % bank length gently sloping (>135°): 10
 % bank length with overhanging vegetation: 10

BANK CONDITION

% bank length vegetated, stable: 80
 % bank length unvegetated, stable: 15
 % bank length vegetated, unstable: 5
 % bank length unvegetated, unstable: 0

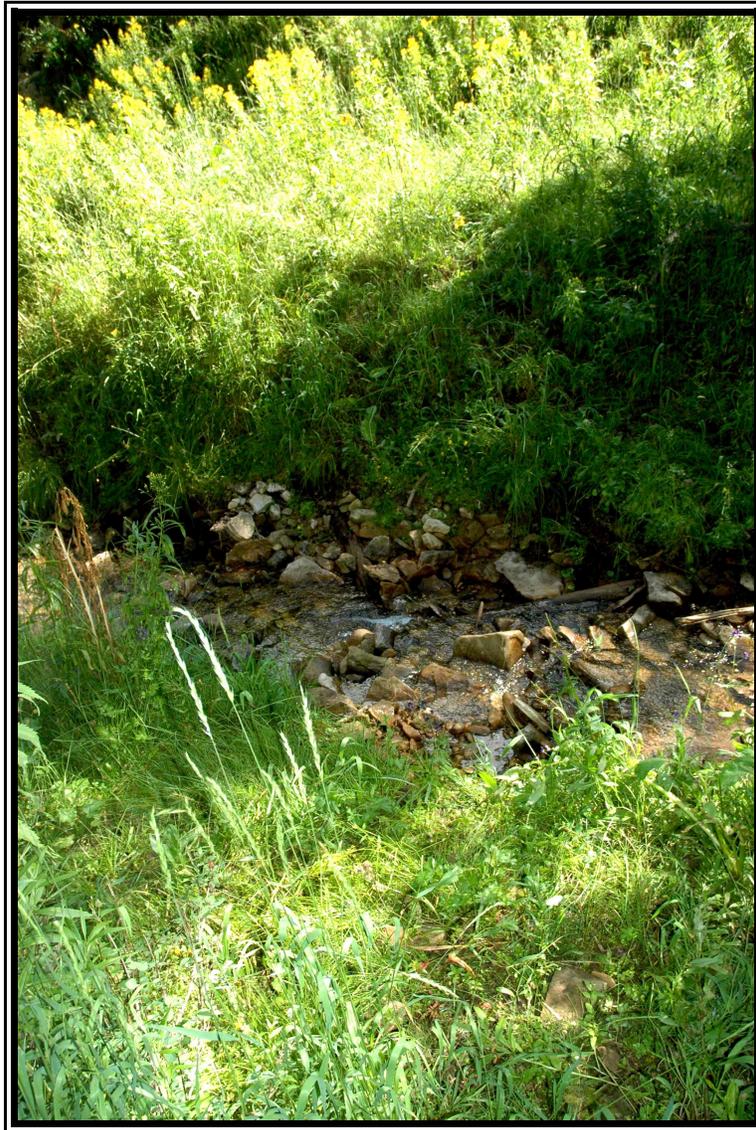
NOTES:

- 1) On the left side, the upper 3 ft of the riparian zone may be influenced by hillside and stream water.
- 2) Re-set coordinates with GPS in 2011.

DATA SUMMARY

WQ-23: Cover by community types in Winter Quarters Canyon (2011).	
UPLAND VEGETATION	Cover (ft)
	10.00
	3.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera/Ranunculus cymbalaria</i>	2.00
<i>Equisetum arvense/Elymus canadensis</i>	2.00
Geranium richardsonii/Carex hoodii	4.00
Equisetum arvense	2.00
TOTAL COVER (Upland Species)	13.00
TOTAL COVER (Riparian Species)	10.00
ROCK (channel)	1.00
WATER (channel)	5.00
BAREGROUND (channel)	0.00
LITTER	1.00
MOSS	0.00
TOTAL COVER	30.00

PHOTOGRAPHIC DOCUMENTATION



WQ-23

**RIPARIAN COMPLEX DATA SHEET
AUGUST 2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-35

WATERBODY NAME: Winter Quarters Canyon Creek (Section 11 tributary)

LOCATION: Southern Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STREAM ASPECT: north

STREAM GRADIENT: 1-2 °

ELEVATION: ~8478 ft.

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Conifer

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800

BEAVER ACTIVITY: none

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Ribes sp.</i>	<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>	<i>Delphinium barbeyi</i>	<i>Carex hoodii</i>
		<i>Equisetum arvense</i>	<i>Elymus canadensis</i>
		<i>Geranium richardsonii</i>	<i>Poa pratensis</i>
		<i>Helianthella uniflora</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Rudbeckia occidentalis</i>	
		<i>Senecio serra</i>	

POOL ATTRIBUTES

% area in pools: 0 (dry in 2010, but water in 2011)

% pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0

% stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 50

% bank length gently sloping (>135°): 50

% bank length with overhanging vegetation: 25

BANK CONDITION

% bank length vegetated, stable: 80

% bank length unvegetated, stable: 10

% bank length vegetated, unstable: 0

% bank length unvegetated, unstable: 10

NOTES:

- 1) New sample site in 2008 year.
- 2) Good flat riparian community to monitor on the right site.
- 3) Channel was dry in 2010, but a good flow was present in 2011.
- 4) In 2011, two conifers had fallen across the stream channel and transect area, probably from flooding, and took out the stake. This did not seem to impact the riparian vegetation at this site.
- 5) So, like in 2010, the stake was reset at previous year distance (49 ft).

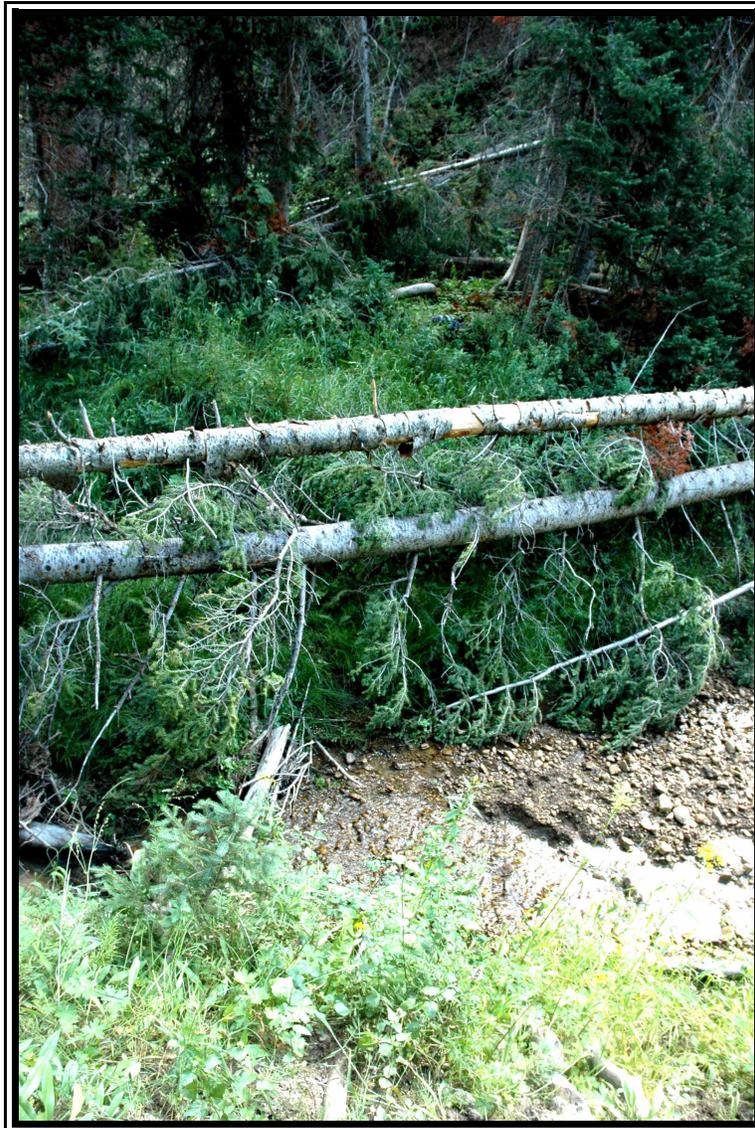
DATA SUMMARY

WQ-35: Cover by community types in Winter Quarters Canyon (2011).

USDA Forest Service Protocol (1992)

UPLAND VEGETATION	8.00
	14.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Geranium richardsonii</i>	2.00
<i>Agrostis stolonifera</i>	5.00
<i>Elymus canadensis</i>	10.00
<hr/>	
TOTAL COVER (Upland Species)	22.00
TOTAL COVER (Riparian Species)	17.00
ROCK (channel)	2.00
WATER (channel)	8.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<hr/>	
TOTAL COVER	49.00
<hr/>	

PHOTOGRAPHIC DOCUMENTATION



WQ-35

**RIPARIAN COMPLEX DATA SHEET
AUGUST 2011**

CLIENT: *Canyon Fuel Company, Skyline Mines*

COMPLEX: *Number WQ-36*

WATERBODY NAME: *Winter Quarters Canyon Creek (Section 11 tributary)*

LOCATION: *Southern Wasatch Plateau, Utah*

DATE: *August 24 - August 31, 2011*

OBSERVER(S): *P.D. Collins*

QUAD NAME: *Scofield, Utah*

GEOLOGIC PARENT MATERIAL: *Blackhawk Formation*

STEAM ASPECT: *north*

STREAM GRADIENT: *1-2 °*

ELEVATION: *8475 ft*

SIZE OF COMPLEX: *(see quantitative data)*

ADJACENT UPLAND VEGETATION (looking downstream)

Left: *Conifer*

Right: *Conifer*

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: *Climax*

APPARENT FORAGE TREND: *Stable*

ESTIMATED FORAGE PRODUCTION: *800*

BEAVER ACTIVITY: *no*

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
		<i>Delphinium barbeyi</i>	<i>Elymus canadensis</i>
		<i>Geranium richardsonii</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Senecio serra</i>	

POOL ATTRIBUTES

% area in pools: 0 (dry)
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 25
 % bank length gently sloping (>135°): 75
 % bank length with overhanging vegetation: 75 (herbaceous)

BANK CONDITION

% bank length vegetated, stable: 85
 % bank length unvegetated, stable: 5
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 10

NOTES:

- 1) This was a new site for 2008 monitoring.
- 2) There was an especially good riparian community on the left side for monitoring.
- 3) This sample site was somewhat more than the prescribed distance from the last monitoring station because a spring would have made the appropriate distance difficult to accurately monitor. That said, even in this area there could have been some hillside water influence to the riparian community. I would guess it about a 70% chance that this influence existed.
- 4) 2008, 2009, and 2011 there water in the stream channel (it was dry in 2010, but water surfaced ~50 ft downstream that year).
- 5) In 2010, I was stung by a wasp on the way to this site at 75 ft downstream (marked as waypoint "WQBee" on GPS).

DATA SUMMARY

WQ-36: Cover by community types in Winter Quarters Canyon (2011).

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

10.00
8.00

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

Agrostis stolonifera/Ranunculus cymbalaria
Geranium richardsonii

17.00
2.00

TOTAL COVER (Upland Species) 18.00

TOTAL COVER (Riparian Species) 19.00

ROCK (channel) 3.00

WATER (channel) 2.00

BAREGROUND (channel) 0.00

LITTER 0.00

MOSS 0.00

TOTAL COVER 42.00

PHOTOGRAPHIC DOCUMENTATION



WQ-36

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-25

WATERBODY NAME: Winter Quarters Canyon Creek (Unnamed tributary east of Box Canyon) LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3°

ELEVATION: 8,783 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Spruce/Fir/Aspen

Right: Spruce/Fir/Aspen

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies lasiocarpa</i>	<i>Ribes sp.</i>	<i>Geranium richardsonii</i>	<i>Agrostis stolonifera</i>
<i>Picea pungens</i>		<i>Mimulus guttatus</i>	<i>Elymus spicatus</i>
<i>Populus tremuloides</i>		<i>Osmorhiza depauperata</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Rudbeckia occidentalis</i>	

POOL ATTRIBUTES

- % area in pools: 40
- % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

- % streambed with filamentous algae: 0
- % stream margin with rooted aquatic: *Some rooted Racy*

BANK TYPE & VEGETATION OVERHANG

- % bank length undercut (<90°): 10
- % bank length gently sloping (>135°): 30
- % bank length with overhanging vegetation: 90 (herbaceous)

BANK CONDITION

- % bank length vegetated, stable: 95
- % bank length unvegetated, stable: 5
- % bank length vegetated, unstable: 0
- % bank length unvegetated, unstable: 0

NOTES:

- 1) *Good, well-defined river channel.*
- 2) *Bank slope increases abruptly. Therefore riparian habitat on right.*
- 3) *Right side had 100% riparian vegetation cover.*

DATA SUMMARY

WQ-25: Cover by community types in Winter Quarters Canyon (2011).	
UPLAND VEGETATION	Cover (ft)
	7.00
	6.50
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i> / <i>Ranunculus cymbalaria</i>	13.00
<hr/>	
TOTAL COVER (Upland Species)	13.50
TOTAL COVER (Riparian Species)	13.00
ROCK (channel)	0.00
WATER (channel)	2.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<hr/>	
TOTAL COVER	28.50

PHOTOGRAPHIC DOCUMENTATION



WQ-25

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-24

WATERBODY NAME: Winter Quarters Canyon Creek (Unnamed tributary east of Box Canyon)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3^o

ELEVATION: 8,737 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Grass/Forb (Ruoc)

Right: Grass/Forb (Ruoc)

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 1,100 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Rudbeckia occidentalis</i>	
		<i>Senecio serra</i>	

POOL ATTRIBUTES

- % area in pools: *50*
- % pool area made up of pools > 2' deep: *no*

AQUATIC VEGETATION

- % streambed with filamentous algae: *no*
- % stream margin with rooted aquatic: *no*

BANK TYPE & VEGETATION OVERHANG

- % bank length undercut (<90°): *50*
- % bank length gently sloping (>135°): *0*
- % bank length with overhanging vegetation: *100 (herbaceous)*

BANK CONDITION

- % bank length vegetated, stable: *95*
- % bank length unvegetated, stable: *5*
- % bank length vegetated, unstable: *0*
- % bank length unvegetated, unstable: *0*

NOTES:

DATA SUMMARY

WQ-24: Cover by community types in Winter Quarters Canyon (2011).

	Cover (ft)
UPLAND VEGETATION	
	8.00
	7.00
 RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
 <u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i> / <i>Elymus canadensis</i>	5.00
<i>Agrostis stolonifera</i>	3.50
<hr/> TOTAL COVER (Upland Species)	<hr/> 15.00
TOTAL COVER (Riparian Species)	8.50
ROCK (channel)	0.00
WATER (channel)	2.50
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<hr/> TOTAL COVER	<hr/> 26.00 <hr/>

PHOTOGRAPHIC DOCUMENTATION



WQ-24

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-06

WATERBODY NAME: Winter Quarters Canyon Creek (Unnamed tributary east of Box Canyon)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-3°

ELEVATION: 8,709ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Blue Spruce Right: Blue Spruce

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 900 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Lonicera involucrate (young)</i>	<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
	<i>Rosa woodsii</i>	<i>Delphinium barbeyi</i>	<i>Bromus carinatus</i>
		<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
		<i>Mimulus guttatus</i>	
		<i>Osmorhiza depauperata</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Rudbeckia occidentalis</i>	

POOL ATTRIBUTES

- % area in pools: 50
- % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

- % streambed with filamentous algae: 0
- % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

- % bank length undercut (<90°): 50
- % bank length gently sloping (>135°): 10
- % bank length with overhanging vegetation: 80 (herbaceous)

BANK CONDITION

- % bank length vegetated, stable: 90
- % bank length unvegetated, stable: 0
- % bank length vegetated, unstable: 5
- % bank length unvegetated, unstable: 5

NOTES:

- 1) Good supply of water this year
- 2) The right bank of this site was steep and moisture from the bank may also influence the riparian vegetation.
- 3) The riparian species on the banks were well defined on left visually.
- 4) The right stake was missing in 2009 so it was re-staked using the 2008 measured transect distance (32 ft). Distance was 31 ft in 2010, but 30 ft in 2011 (perhaps 1 ft was lost from hillside movement).

DATA SUMMARY

WQ-06: Cover by community types in Winter Quarters Canyon (2011).

UPLAND VEGETATION	Cover (ft)
	8.00
	6.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	6.00
<i>Ranunculus cymbalaria/Agrostis stolonifera</i>	6.00
TOTAL COVER (Upland Species)	14.00
TOTAL COVER (Riparian Species)	12.00
ROCK (channel)	2.00
WATER (channel)	2.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	30.00

PHOTOGRAPHIC DOCUMENTATION



WQ-06

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-41 (New in 2011)

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-2 °

ELEVATION: 8,625 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Herb

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Increasing

ESTIMATED FORAGE PRODUCTION: 1,000

BEAVER ACTIVITY: no

PHOTOGRAPH TAKEN:

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: Mining, grazing, hunting, recreation.

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies concolor</i>	<i>Ribes sp.</i>	<i>Delphinium barbeyi</i>	<i>Carex hoodii</i>
<i>Populus tremuloides</i>		<i>Equisetum arvense</i>	<i>Elymus canadensis</i>
		<i>Heracleum lanata</i>	
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Senecio serra</i>	
		<i>Swertia radiata</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 70
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 100 left side
 % bank length gently sloping (>135°): 100 right side
 % bank length with overhanging vegetation:

BANK CONDITION

% bank length vegetated, stable: 98
 % bank length unvegetated, stable: 2
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 0

NOTES:

- 1) New site in 2011.
- 2) Although the right side 10 ft was called "upland", the *Elymus canadensis* and moisture here seemed to be coming from drainage from the side slope.
- 3) Use the left 1 ft and right 13 ft to monitor riparian vegetation.

DATA SUMMARY

**WQ-41: Cover by community types in Winter Quarters Canyon
(2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION	10.00
	10.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Ranunculus cymbalaria</i>	1.00
<i>Swertia radiata/Equisetum arvense</i>	13.00
TOTAL COVER (Upland Species)	20.00
TOTAL COVER (Riparian Species)	14.00
ROCK (channel)	1.00
WATER (channel)	1.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	36.00

PHOTOGRAPHIC DOCUMENTATION



WQ-41

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-32

WATERBODY NAME: Winter Quarters Canyon Creek (Box Canyon)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: ENE

STREAM GRADIENT: 1-3^o

ELEVATION: 8,870 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Grass/Forb Right: Aspen/Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 1,200 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Equisetum arvensis</i>	<i>Elymus canadensis</i>
		<i>Geranium richardsonii</i>	
		<i>Mimulus guttatus</i>	
		<i>Rudbeckia occidentalis</i>	
		<i>Urtica dioica</i>	
		<i>Viguiera multiflora</i>	

POOL ATTRIBUTES

% area in pools: 50
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 50
 % bank length gently sloping (>135°): 0
 % bank length with overhanging vegetation: 100 (herbaceous)

BANK CONDITION

% bank length vegetated, stable: 100
 % bank length unvegetated, stable: 0
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 0

NOTES:

- 1) Good well-defined riparian zone.
- 2) Good water flow; flow also continues from upper canyon reaches.
- 3) It was thought that the riparian zone and sampling locations were well-represented in Box Canyon, so more sampling upstream was not done.
- 4) This site was re-marked with the GPS in 2011.
- 5) Recently fallen trees (see photo).

DATA SUMMARY

WQ-32: Cover by community types in Winter Quarters Canyon (2011).

UPLAND VEGETATION	Cover (ft)
	8.00
	7.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	7.50
<i>Elymus canadensis</i>	6.00
TOTAL COVER (Upland Species)	15.00
TOTAL COVER (Riparian Species)	13.50
ROCK (channel)	0.00
WATER (channel)	1.50
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	30.00

PHOTOGRAPHIC DOCUMENTATION



WQ-32

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-31

WATERBODY NAME: Winter Quarters Canyon Creek (Box Canyon)

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: ENE

STREAM GRADIENT: 1-3^o

ELEVATION: 8,868 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: *Aspen* Right: *Conifer*

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: *Climax*

APPARENT FORAGE TREND: *Stable*

ESTIMATED FORAGE PRODUCTION: 500 lbs/acre

BEAVER ACTIVITY: *No*

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies lasiocarpa</i>	<i>Symphoricarpos oreophilus</i>	<i>Arnica cordifolia</i>	<i>Agrostis stolonifera</i>
<i>Picea pungens</i>		<i>Equisetum arvensis</i>	<i>Calamagrostis canadensis</i>
<i>Populus tremuloides</i>		<i>Geranium richardsonii</i>	<i>Carex hoodii</i>
		<i>Ranunculus cymbalaria</i>	<i>Juncus longistylis</i>
		<i>Rudbeckia occidentalis</i>	

POOL ATTRIBUTES

% area in pools: 50
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 100
 % bank length gently sloping (>135°): 0
 % bank length with overhanging vegetation: 0

BANK CONDITION

% bank length vegetated, stable: 80
 % bank length unvegetated, stable: 10
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 10

NOTES:

- 1) This was a good sample site because the riparian and upland zones were obvious.
- 2) There was no ambiguity about what water was influencing the riparian zone - it was the stream water, not the side-slope ground moisture.
- 3) As mentioned in 2009 only, the left upland slope appeared unstable.
- 4) In 2011, the left slope including the riparian area had been disturbed by elk.

DATA SUMMARY

WQ-31: Cover by community types in Winter Quarters Canyon (2011).

	Cover (ft)
UPLAND VEGETATION	
	12.00
	5.00
 RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
 <u>Dominant Herbaceous Species</u>	
<i>Elymus canadensis</i>	7.00
TOTAL COVER (Upland Species)	17.00
TOTAL COVER (Riparian Species)	7.00
ROCK (channel)	0.00
WATER (channel)	2.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
 TOTAL COVER	26.00

PHOTOGRAPHIC DOCUMENTATION



WQ-31

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: *Canyon Fuel Company, Skyline Mines*

COMPLEX: *Number WQ-30*

WATERBODY NAME: *Winter Quarters Canyon Creek (Box Canyon)*

LOCATION: *Wasatch Plateau, Utah*

DATE: *August 24 - August 31, 2011*

OBSERVER(S): *P.D. Collins*

QUAD NAME: *Scofield, Utah*

GEOLOGIC PARENT MATERIAL: *Blackhawk Formation*

STEAM ASPECT: *ENE*

STREAM GRADIENT: *1-3^o*

ELEVATION: *8,856 ft*

SIZE OF COMPLEX: *(see quantitative data)*

ADJACENT UPLAND VEGETATION (looking downstream)

Left: *Aspen/Conifer* Right: *Conifer*

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
<i>(refer to quantitative data results for this information)</i>	

SUCCESSIONAL STATUS: *Climax*

APPARENT FORAGE TREND: *Stable*

ESTIMATED FORAGE PRODUCTION: *1,400 lbs/acre*

BEAVER ACTIVITY: *No*

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Ribes sp.</i>	<i>Geranium richardsonii</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Helianthella uniflora</i>	<i>Carex hoodii</i>
		<i>Lathyrus lanszwertii</i>	<i>Elymus canadensis</i>
		<i>Helianthella uniflora</i>	
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: *70*
 % pool area made up of pools > 2' deep: *0*

AQUATIC VEGETATION

% streambed with filamentous algae: *0*
 % stream margin with rooted aquatic: *0*

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): *60*
 % bank length gently sloping (>135°): *0*
 % bank length with overhanging vegetation: *95 (shrubs & herbs)*

BANK CONDITION

% bank length vegetated, stable: *98*
 % bank length unvegetated, stable: *2*
 % bank length vegetated, unstable: *0*
 % bank length unvegetated, unstable: *0*

NOTES:

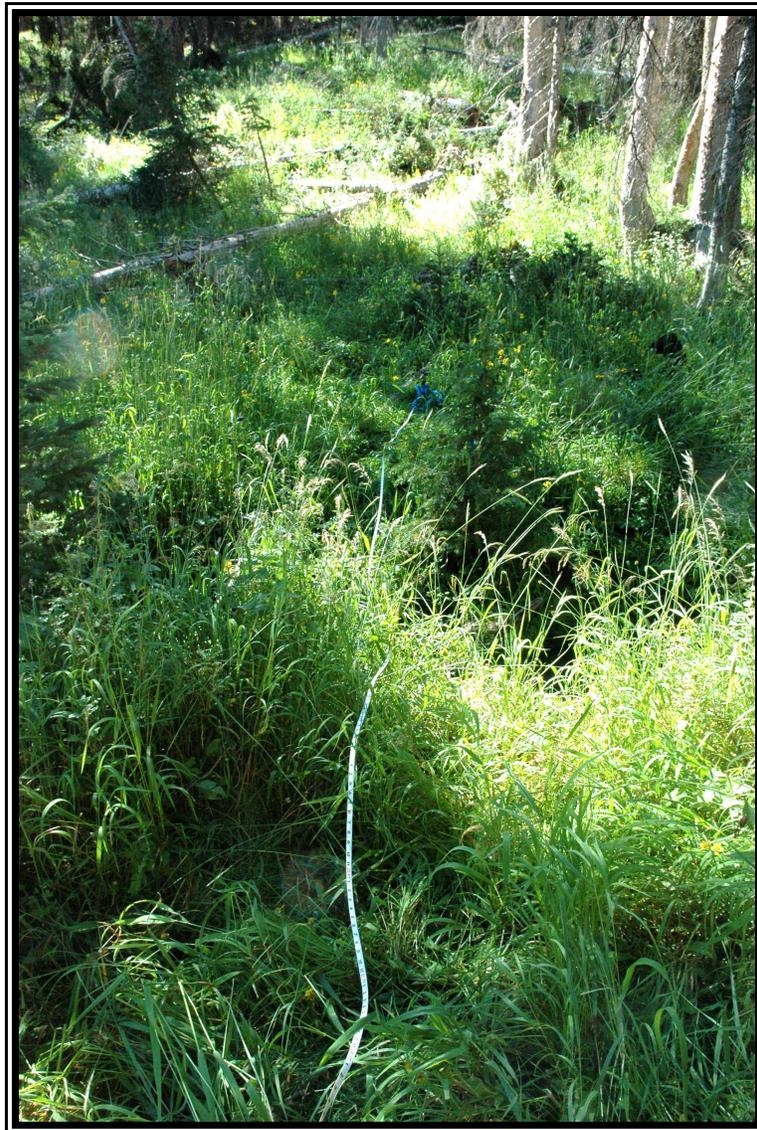
- 1) There was a lot of water here with 4 ft wide pools.
- 2) The left side riparian species (mostly Agst) had expanded this year (2011), 20 ft or so, even past the marker which I left in place. Water was running around the marker.

DATA SUMMARY

WQ-30 Cover by community types in Winter Quarters Canyon (2011).

	Cover (ft)
UPLAND VEGETATION	0.00
	4.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	12.00
<i>Elymus canadensis</i>	4.00
<i>Carex hoodii</i> / <i>Geranium richardsonii</i>	4.00
TOTAL COVER (Upland Species)	4.00
TOTAL COVER (Riparian Species)	20.00
ROCK (channel)	0.00
WATER (channel)	4.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	28.00

PHOTOGRAPHIC DOCUMENTATION



WQ-30

**RIPARIAN COMPLEX DATA SHEET
AUGUST 2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-33

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Southern Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STREAM ASPECT: N

STREAM GRADIENT: 1-2 °

ELEVATION: 8769 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Mtn Grassland/Conifer

Right: Mtn Grassland/Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types):

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800 lbs./ac

BEAVER ACTIVITY: Several beaver ponds located below this site.

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Symphoricarpos oreophilus</i>	<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Lupinus sp.</i>	<i>Carex hoodii</i>
<i>Sambucus caerulea</i>		<i>Mimulus guttatus</i>	<i>Elymus canadensis</i>
		<i>Rudbeckia occidentalis</i>	
		<i>Taraxacum officinale</i>	

POOL ATTRIBUTES

% area in pools: *35 (100% at transect line)*

% pool area made up of pools > 2' deep: *0*

AQUATIC VEGETATION

% streambed with filamentous algae: *0*

% stream margin with rooted aquatic: *0*

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): *30*

% bank length gently sloping (>135°): *20*

% bank length with overhanging vegetation: *20 (herbaceous)*

BANK CONDITION

% bank length vegetated, stable: *90*

% bank length unvegetated, stable: *10*

% bank length vegetated, unstable: *0*

% bank length unvegetated, unstable: *0*

NOTES:

- 1) This is a new sample location for 2008.
- 2) There was lots of beaver influence below this site.
- 3) Conifers had fallen across the transect line this year. This was common over the entire study area. Bark beetle had killed the conifers then a lot of precipitation this year (and/or wind) had caused the trees to fall.

DATA SUMMARY

**WQ- 33: Cover by community types in Winter Quarters Canyon
(2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

8.00
7.00

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

Elymus canadensis 4.00
Equisetum arvense 3.00
Carex hoodii 5.00

TOTAL COVER (Upland Species) 15.00

TOTAL COVER (Riparian Species) 12.00

ROCK (channel) 2.50

WATER (channel) 2.50

BAREGROUND (channel) 1.00

LITTER 0.00

MOSS 0.00

TOTAL COVER 33.00

PHOTOGRAPHIC DOCUMENTATION



WQ-33

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-03

WATERBODY NAME: Winter Quarters Canyon Creek; upper Box Canyon

LOCATION: Southern Wasatch Plateau, Utah; upper Box Canyon

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: ENE

STREAM GRADIENT: 2°

ELEVATION: 8,729 ft.

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Mtn. Herbland

Right: Mtn. Herbland

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Increasing

ESTIMATED FORAGE PRODUCTION: 1,500 lbs./acre

BEAVER ACTIVITY: see Notes

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Helianthella uniflora</i>	<i>Carex nebrascensis</i>
		<i>Senecio serra</i>	<i>Carex hoodii</i>
		<i>Viguiera multiflora</i>	<i>Juncus arcticus</i>
			<i>Juncus longistylis</i>

POOL ATTRIBUTES

% area in pools: 50
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 50 (much of the stream had rooted vegetation)

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 30
 % bank length gently sloping (>135°): 0
 % bank length with overhanging vegetation: 95

BANK CONDITION

% bank length vegetated, stable: 95
 % bank length unvegetated, stable: 5
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 0

NOTES:

- 1) This site was approx. 400 ft upstream from a very old beaver dam.
- 2) There was very little water at the site - about 12" wide in 2010 and 18" in 2011.
- 3) This site's elev. may be too high to always observe water. This appears to be a good water year; there may be no water here in lower prec. years.
- 4) The adjacent areas were open areas (Mtn. Herblands)
- 5) Right side stake was missing; it was replaced at the 2009 transect distance.

DATA SUMMARY

**WQ-03: Cover by community types in Winter Quarters Canyon
(2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION	9.00
	7.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Carex hoodii</i>	4.00
<i>Equisetum arvense/Geranium richardsonii</i>	4.00
<i>Carex hoodii/Juncus arcticus</i>	5.50
TOTAL COVER (Upland Species)	16.00
TOTAL COVER (Riparian Species)	13.50
ROCK (channel)	0.00
WATER (channel)	1.50
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<u>TOTAL COVER</u>	<u>31.00</u>

PHOTOGRAPHIC DOCUMENTATION



WQ-03

**RIPARIAN COMPLEX DATA SHEET
AUGUST 2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-34

WATERBODY NAME: Winter Quarters Canyon Creek; upper Box Canyon

LOCATION: Southern Wasatch Plateau, Utah; upper Box Canyon

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: ENE

STREAM GRADIENT: 2°

ELEVATION: 8,729 ft.

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Mtn. Herbland/Conifer

Right: Mtn. Herbland/Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800 lbs./acre

BEAVER ACTIVITY: see Notes

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies lasiocarpa</i>	<i>Ribes sp.</i>	<i>Equisetum arvense</i>	<i>Agrostis stolonifera</i>
		<i>Geranium richardsonii</i>	<i>Carex hoodii</i>
		<i>Mimulus guttatus</i>	<i>Carex nebrascensis</i>
		<i>Senecio serra</i>	<i>Elymus canadensis</i>
			<i>Phleum pratensis</i>

POOL ATTRIBUTES

% area in pools: 20
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 40
 % bank length gently sloping (>135°): 0
 % bank length with overhanging vegetation: 90 (herbaceous)

BANK CONDITION

% bank length vegetated, stable: 80
 % bank length unvegetated, stable: 15
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 5

NOTES:

- 1) This site was a new sample station in 2008.
- 2) Like 2010, the left side riparian community was sloughing, and about 2 ft of the transect was lost (from 33 ft in 2010 to 31 ft in 2011).
- 3) Quite a bit of *Elymus canadensis* here.

DATA SUMMARY

WQ-34: Cover by community types in Winter Quarters Canyon (2011).

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

5.00
10.00

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

<i>Carex hoodii</i>	6.00
<i>Equisetum arvense</i>	2.00
<i>Elymus canadensis</i>	5.00

TOTAL COVER (Upland Species)	15.00
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TOTAL COVER (Riparian Species)	13.00
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ROCK (channel)	0.00
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WATER (channel)	3.00
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BAREGROUND (channel)	0.00
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LITTER	0.00
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MOSS	0.00
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TOTAL COVER	31.00
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PHOTOGRAPHIC DOCUMENTATION



WQ-34

**RIPARIAN COMPLEX DATA SHEET
AUGUST 2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-04

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Southern Wasatch Plateau, Utah; Lower Box Canyon

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: NE

STREAM GRADIENT: ~2 °

ELEVATION: 8,664 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream):

Left: Aspen/Mtn. Herbland

Right: Blue Spruce/Mtn. Herbland

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800 lbs/acre

BEAVER ACTIVITY: Historical activity a few hundred feet upstream.

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: Mining, grazing, hunting, recreation.

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Aster sp.</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Geranium richardsonii</i>	<i>Carex hoodii</i>
		<i>Lupinus sp.</i>	<i>Elymus canadensis</i>
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Senecio serra</i>	
		<i>Urtica dioica</i>	
		<i>Viguiera multiflora</i>	

POOL ATTRIBUTES

% area in pools: 50
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 10
 % bank length gently sloping (>135°): 20
 % bank length with overhanging vegetation: 50 (herb.)

BANK CONDITION

% bank length vegetated, stable: 90
 % bank length unvegetated, stable: 10
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 0

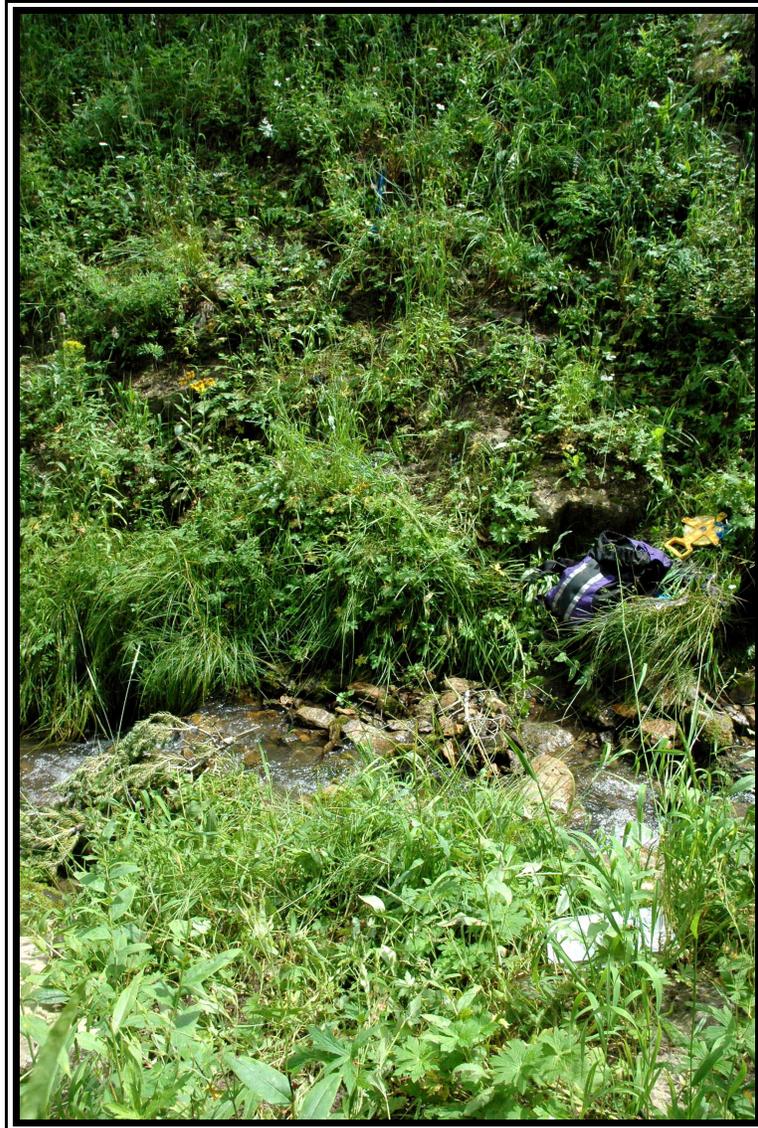
NOTES:

- 1) This site is approx. midway between main channel and upper Box Canyon sample point.
- 2) In 2009, we were not sure why there was more riparian width here compared to 2005; the 2010 measurement was similar to 2009.
- 3) Left stake was displaced in 2009 and it was re-staked on this side using the 2008 measured transect distance (27 ft); in 2010 it was 27 ft; in 2011 26 ft (1 ft lost due to sloughing).

DATA SUMMARY

<u>WQ04: Cover by community types in Winter Quarters Canyon (2011).</u>	
<u>USDA Forest Service Protocol (1992)</u>	
UPLAND VEGETATION	
	8.00
	6.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Carex hoodii/Juncus arcticus</i>	1.00
<i>Agrostis stolonifera/Carex hoodii</i>	2.00
<i>Carex hoodii/Geranium richardsonii</i>	5.00
TOTAL COVER (Upland Species)	14.00
TOTAL COVER (Riparian Species)	8.00
ROCK (channel)	2.00
WATER (channel)	3.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<u>TOTAL COVER</u>	<u>27.00</u>

PHOTOGRAPHIC DOCUMENTATION



WQ-04

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-01

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: 1-2 °

ELEVATION: 8,656ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Herb

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 900 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Symphoricarpos oreophilus</i>	<i>Achillea millefolium</i>	<i>Carex hoodii</i>
		<i>Aster sp.</i>	<i>Elymus canadensis</i>
		<i>Polygonum sp.</i>	<i>Agrostis stolonifera</i>
		<i>Ranunculus cymbalaria</i>	
		<i>Senecio serra</i>	
		<i>Urtica dioica</i>	
		<i>Veratrum californicum</i>	

POOL ATTRIBUTES

% area in pools: 5
 % pool area made up of pools > 2' deep:

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic:

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°):
 % bank length gently sloping (>135°): 50% on left side only
 % bank length with overhanging vegetation: 0

BANK CONDITION

% bank length vegetated, stable: 70
 % bank length unvegetated, stable: 20
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 10

NOTES:

- 1) All of left bar was considered riparian-influenced (22.5 ft in 2010; 19.0 ft in 2011).
- 2) New GPS coordinates were taken here in 2010.
- 3) Could not find the right stake in 2011, so I placed it at the 2010 distance (47 ft).

DATA SUMMARY

WQ-01: Cover by community types in Winter Quarters Canyon (2011).	
UPLAND VEGETATION	Cover (ft)
	8.00
	8.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Elymus canadensis</i>	4.00
<i>Agrostis stolonifera/Ranunculus cymbalaria</i>	3.00
<i>Carex hoodii/Elymus canadensis</i>	18.00
TOTAL COVER (Upland Species)	16.00
TOTAL COVER (Riparian Species)	25.00
ROCK (channel)	0.00
WATER (channel)	6.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	47.00

PHOTOGRAPHIC DOCUMENTATION



WQ-01

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-37 (New in 2010)

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: 1-2 °

ELEVATION: 8,622 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Snowberry

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 1,100 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN:

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: Mining, grazing, hunting, recreation.

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>		<i>Helianthella uniflora</i>	<i>Agrostis stolonifera</i>
<i>Populus angustifolia</i>		<i>Mimulus guttatus</i>	<i>Carex hoodii</i>
		<i>Ranunculus cymbalaria</i>	<i>Elymus canadensis</i>
		<i>Senecio serra</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 75
 % pool area made up of pools > 2' deep:

AQUATIC VEGETATION

% streambed with filamentous algae: no
 % stream margin with rooted aquatic: no

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 50% on left side
 % bank length gently sloping (>135°): 100% right side (2 ft)
 % bank length with overhanging vegetation:

BANK CONDITION

% bank length vegetated, stable: 85
 % bank length unvegetated, stable: 5
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 10

NOTES:

- 1) A new site in 2010.
- 2) The left side was a point bar with a good, flat riparian zone.
- 3) The right side was considered a riparian zone only to the steep bank (~ 2 ft). After that the vegetation was influence by side slope moisture.
- 4)The 2011 water year appeared greater; the left side riparian area seemed to have expanded.
- 5)The transect length went from 42 ft in 2010 to 39 ft in 2011. Flooding seemed to have done damage to the area this year (see photographs below).

DATA SUMMARY

WQ-37: Cover by community types in Winter Quarters Canyon (2011).	
UPLAND VEGETATION	Cover (ft)
	0.00
	6.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Carex hoodii/Elymus canadensis</i>	10.00
<i>Agrostis stolonifera</i>	13.00
<i>Agrostis stolonifera/Ranunculus cymbalaria</i>	2.00
TOTAL COVER (Upland Species)	6.00
TOTAL COVER (Riparian Species)	25.00
ROCK (channel)	0.00
WATER (channel)	4.00
BAREGROUND (channel)	4.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	39.00

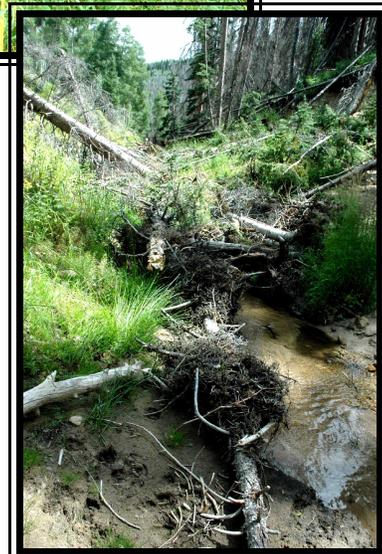
PHOTOGRAPHIC DOCUMENTATION



WQ-37



Flood Evidence



More Flooding Evidence

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-02

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Southern Wasatch Plateau, Utah; Bob's Canyon

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: ~2°

ELEVATION: 8,619 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Snowberry

Right: Spruce/Fir

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Increasing

ESTIMATED FORAGE PRODUCTION: 700 lbs./acre

BEAVER ACTIVITY: no

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Rosa woodsii</i>	<i>Carduus nutans</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>		<i>Equisetum arvense</i>	<i>Bromus japonicus</i>
		<i>Geranium richardsonii</i>	<i>Carex hoodii</i>
		<i>Helianthella uniflora</i>	<i>Elymus canadensis</i>
		<i>Lupinus argenteus</i>	
		<i>Rubus idaeus</i>	
		<i>Rudbeckia occidentalis</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 10

% pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0

% stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): average = 50%; 100% on right side

% bank length gently sloping (>135°): 20

% bank length with overhanging vegetation: 10

BANK CONDITION

% bank length vegetated, stable: 95 right; 25 left

% bank length unvegetated, stable: 5 right; 0 left

% bank length vegetated, unstable: 0 right; 25 left

% bank length unvegetated, unstable: 0 right; 50 left

NOTES:

- 1) The right side had a bench that supported some riparian species, but it was probably due to hillside moisture, not the stream directly.
- 2) The riparian area measured was well defined below the right bench and left hillside.
- 3) In 2009, we found the right stake, but not the left. In 2010, it was re-staked it at the previous measured length of (28 ft).
- 4) In 2011 we found the flags on right side but no stake due to coverage by fallen trees from much sloughing this year. Put transect at 28 ft again.
- 5) On the left side there was not much living cover; it was not stable on that side either.

DATA SUMMARY

WQ-02: Cover by community types in Winter Quarters Canyon (2011).	
<u>USDA Forest Service Protocol (1992)</u>	
UPLAND VEGETATION	
	9.00
	9.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	5.00
TOTAL COVER (Upland Species)	18.00
TOTAL COVER (Riparian Species)	5.00
ROCK (channel)	0.00
WATER (channel)	5.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<u>TOTAL COVER</u>	<u>28.00</u>

PHOTOGRAPHIC DOCUMENTATION



WQ-02

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-38 (New in 2010)

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: N

STREAM GRADIENT: 1-2 °

ELEVATION: 8,566 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Snowberry

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 700

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies concolor</i>	<i>Ribes sp.</i>	<i>Equisetum arvense</i>	<i>Agrostis stolonifera</i>
<i>Picea pungens</i>	<i>Rubus idaeus</i>	<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
<i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>	<i>Helianthella uniflora</i>	<i>Poa secunda</i>
		<i>Polygonum sp.</i>	
		<i>Ranunculus cymbalaria</i>	

POOL ATTRIBUTES

% area in pools: 25
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 50 left; 50 right
 % bank length gently sloping (>135°): 0 left; 100 right (in riparian area)
 % bank length with overhanging vegetation: 20 (herbaceous)

BANK CONDITION

% bank length vegetated, stable: 90
 % bank length unvegetated, stable: 5
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 5

NOTES:

- 1) New site for 2010
- 2) In 2010 the transect length was 31 ft; 2011 was 30 ft.
- 3) Re-marked GPS coordinates in 2011.

DATA SUMMARY

**WQ-38: Cover by community types in Winter Quarters Canyon
(2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

8.00
9.00

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

Geranium richardsonii/Elymus canadensis 2.00
Agrostis stolonifera/Carex hoodii 8.00

TOTAL COVER (Upland Species) 17.00
TOTAL COVER (Riparian Species) 10.00
ROCK (channel) 0.00
WATER (channel) 3.00
BAREGROUND (channel) 0.00
LITTER 0.00
MOSS 0.00

TOTAL COVER 30.00

PHOTOGRAPHIC DOCUMENTATION



WQ-38

**RIPARIAN COMPLEX DATA SHEET
2010**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-05

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: 1-2 °

ELEVATION: 8,545ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Snowberry

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Decreasing; unstable right bank

ESTIMATED FORAGE PRODUCTION: 400

BEAVER ACTIVITY: no

PHOTOGRAPH TAKEN:

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: Mining, grazing, hunting, recreation.

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Abies lasiocarpa</i>	<i>Ribes sp.</i>	<i>Geranium richardsonii</i>	<i>Agrostis stolonifera</i>
<i>Picea pungens</i>	<i>Salix sp.</i>	<i>Heracleum lanatum</i>	<i>Elymus canadensis</i>
<i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>	<i>Mimulus guttatus</i>	<i>Poa pratensis</i>
		<i>Ranunculus cymbalaria</i>	

POOL ATTRIBUTES

- % area in pools: 50
- % pool area made up of pools > 2' deep: no

AQUATIC VEGETATION

- % streambed with filamentous algae: no
- % stream margin with rooted aquatic: no

BANK TYPE & VEGETATION OVERHANG

- % bank length undercut (<90°): not on the transect line, but close upstream
- % bank length gently sloping (>135°): 0
- % bank length with overhanging vegetation: 50 left; 100 right

BANK CONDITION

- % bank length vegetated, stable: 70
- % bank length unvegetated, stable: 5
- % bank length vegetated, unstable: 20
- % bank length unvegetated, unstable: 5

NOTES:

- 1) Reset GPS in 2010 (previous coordinates put this site in an unlikely place).
- 2) Reset again in 2011
- 3) In 2010, this site was relocated ~ 50 ft downstream from old waypoint.
- 4) There seemed to be riparian spp this year due to increase water.
- 5) This area was vulnerable to undercutting by high water.
- 6) This area is a less-than-desirable riparian monitoring station.
- 7) The site is now located just upstream from No-Name confluence.

DATA SUMMARY

**WQ-05: Cover by community types in Winter Quarters Canyon
 (2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION	
	8.00
	8.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	2.00
<i>Equisetum arvense/Geranium richardsonii</i>	8.00
TOTAL COVER (Upland Species)	16.00
TOTAL COVER (Riparian Species)	10.00
ROCK (channel)	1.50
WATER (channel)	4.50
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	32.00

PHOTOGRAPHIC DOCUMENTATION



WQ-05

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-39 (New in 2010)

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: 1-2 °

ELEVATION: 8,507ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Aspen/Snowberry

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 700

BEAVER ACTIVITY: no

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Ribes sp.</i>	<i>Aster sp.</i>	<i>Agrostis stolonifera</i>
<i>Populus tremuloides</i>	<i>Rubus idaeus</i>	<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
		<i>Helianthella uniflora</i>	<i>Carex hoodii</i>
		<i>Heracleum lanatum</i>	
		<i>Lathyrus pauciflorus</i>	
		<i>Mimulus guttatus</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 0

% pool area made up of pools > 2' deep: no

AQUATIC VEGETATION

% streambed with filamentous algae: no

% stream margin with rooted aquatic: no

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 100 on right side

% bank length gently sloping (>135°): 100 on left side

% bank length with overhanging vegetation: 50 (woody)

BANK CONDITION

% bank length vegetated, stable: 90

% bank length unvegetated, stable: 5

% bank length vegetated, unstable: 5

% bank length unvegetated, unstable: 0

NOTES:

- 1) New site in 2010
- 2) I considered all but 10 ft out from fallen tree as a riparian community.
- 3) The site was mostly *Elymus canadensis* which appeared a bit more mesic than wet.
- 4) The site was located just below a spring on the right.
- 5) Re-marked with GPS in 2011.
- 6) Evidence of flooding this year.

DATA SUMMARY

WQ-39: Cover by community types in Winter Quarters Canyon (2011).	
<hr/>	
USDA Forest Service Protocol (1992)	
<hr/>	
UPLAND VEGETATION	
	6.00
	7.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Agrostis stolonifera</i>	15.00
<i>Equisetum arvense/Geranium richardsonii</i>	1.00
TOTAL COVER (Upland Species)	13.00
TOTAL COVER (Riparian Species)	17.00
ROCK (channel)	5.00
WATER (channel)	7.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
TOTAL COVER	42.00
<hr/>	

PHOTOGRAPHIC DOCUMENTATION



WQ-39

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)

POOL ATTRIBUTES

- % area in pools:
- % pool area made up of pools > 2' deep:

AQUATIC VEGETATION

- % streambed with filamentous algae:
- % stream margin with rooted aquatic: *no*

BANK TYPE & VEGETATION OVERHANG

- % bank length undercut (<90°):
- % bank length gently sloping (>135°):
- % bank length with overhanging vegetation:

BANK CONDITION

- % bank length vegetated, stable:
- % bank length unvegetated, stable:
- % bank length vegetated, unstable:
- % bank length unvegetated, unstable:

NOTES:

- 1) In 2010 I could not find the old site; GPS coordinates went to an area with lots of fallen trees, so it may have been covered up. More trees had fallen here in 2011.
- 2) A new station was created, so previous data (pre-2010) cannot be compared to 2010 and later.
- 3) The left side riparian area was mostly level.
- 4) The right side had bank-influence moisture with only 2 ft influenced mostly from the stream.
- 5) This site was eliminated in 2011 because more trees had fallen and it now seems an illogical place to monitor.

DATA SUMMARY

**WQ-07: Cover by community types in Winter Quarters Canyon
(2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

Agrostis stolonifera/Ranunculus cymbalaria

Elymus canadensis/Carex hoodii

TOTAL COVER (Upland Species)

TOTAL COVER (Riparian Species)

ROCK (channel)

WATER (channel)

BAREGROUND (channel)

LITTER

MOSS

TOTAL COVER

PHOTOGRAPHIC DOCUMENTATION



WQ-07 (transect line unobservable; site eliminated)

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-40 (New in 2010)

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: E

STREAM GRADIENT: 1-2 °

ELEVATION: 8,492 ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Blue Spruce/Conifer

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 1,000 lbs/acre

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
<i>Picea pungens</i>	<i>Ribes sp.</i>	<i>Achillea millefolium</i>	<i>Agrostis stolonifera</i>
		<i>Mimulus guttatus</i>	
		<i>Potentilla sp.</i>	
		<i>Ranunculus cymbalaria</i>	
		<i>Urtica dioica</i>	
		<i>Viguiera multiflora</i>	

POOL ATTRIBUTES

% area in pools: 30
 % pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0
 % stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 0
 % bank length gently sloping (>135°): 100
 % bank length with overhanging vegetation:

BANK CONDITION

% bank length vegetated, stable: 100
 % bank length unvegetated, stable: 0
 % bank length vegetated, unstable: 0
 % bank length unvegetated, unstable: 0

NOTES:

- 1) A good, well-defined riparian community was present on the left side.
- 2) The right side had little riparian community.
- 3) This was a new site in 2010.
- 4) Site was located just upstream from the No Name trail head I marked.

DATA SUMMARY

**WQ-40: Cover by community types in Winter Quarters Canyon
 (2011).**

USDA Forest Service Protocol (1992)

UPLAND VEGETATION

10.00
 7.00

RIPARIAN VEGETATION

Dominant Woody Species

Dominant Herbaceous Species

Agrostis stolonifera/Ranunculus cymbalaria

3.00

Agrostis stolonifera

15.00

TOTAL COVER (Upland Species)

17.00

TOTAL COVER (Riparian Species)

18.00

ROCK (channel)

0.00

WATER (channel)

9.00

BAREGROUND (channel)

2.00

LITTER

0.00

MOSS

0.00

TOTAL COVER

46.00

PHOTOGRAPHIC DOCUMENTATION



WQ-40

**RIPARIAN COMPLEX DATA SHEET
2011**

CLIENT: Canyon Fuel Company, Skyline Mines

COMPLEX: Number WQ-09

WATERBODY NAME: Winter Quarters Canyon Creek

LOCATION: Wasatch Plateau, Utah

DATE: August 24 - August 31, 2011

OBSERVER(S): P.D. Collins

QUAD NAME: Scofield, Utah

GEOLOGIC PARENT MATERIAL: Blackhawk Formation

STEAM ASPECT: ENE

STREAM GRADIENT: 1-2 °

ELEVATION: 8,448ft

SIZE OF COMPLEX: (see quantitative data)

ADJACENT UPLAND VEGETATION (looking downstream)

Left: Conifer

Right: Conifer

VEGETATIVE DESCRIPTION (Dominance by Community Types)

Community Name	% of Complex
(refer to quantitative data results for this information)	

SUCCESSIONAL STATUS: Climax

APPARENT FORAGE TREND: Stable

ESTIMATED FORAGE PRODUCTION: 800

BEAVER ACTIVITY: No

PHOTOGRAPH TAKEN: *Yes*

LAND USE ACTIVITIES THAT COULD INFLUENCE RIPARIAN AREA: *Mining, grazing, hunting, recreation.*

SPECIES OBSERVED:

Trees	Shrubs	Forbs	Grasses (or grasslike)
	<i>Symphoricarpos oreophilus</i>	<i>Helianthella uniflora</i>	<i>Agrostis stolonifera</i>
		<i>Mimulus guttatus</i>	<i>Carex hoodii</i>
		<i>Geranium richardsonii</i>	<i>Elymus canadensis</i>
		<i>Ranunculus cymbalaria</i>	<i>Poa secunda</i>
		<i>Urtica dioica</i>	

POOL ATTRIBUTES

% area in pools: 25

% pool area made up of pools > 2' deep: 0

AQUATIC VEGETATION

% streambed with filamentous algae: 0

% stream margin with rooted aquatic: 0

BANK TYPE & VEGETATION OVERHANG

% bank length undercut (<90°): 20% on right side

% bank length gently sloping (>135°): 100% on left side

% bank length with overhanging vegetation: 20 (herbaceous)

BANK CONDITION

% bank length vegetated, stable: 90

% bank length unvegetated, stable: 10

% bank length vegetated, unstable: 0

% bank length unvegetated, unstable: 0

NOTES:

- 1) Even though it was an old site, all stakes were located.
- 2) The coordinates were remarked on the GPS
- 3) Left side riparian seemed to have increased. No riparian on right side due to steep vegetated bank.

DATA SUMMARY

WQ-09: Cover by community types in Winter Quarters Canyon (2011).	
<hr/>	
USDA Forest Service Protocol (1992)	
<hr/>	
UPLAND VEGETATION	
	3.00
	11.00
RIPARIAN VEGETATION	
<u>Dominant Woody Species</u>	
<u>Dominant Herbaceous Species</u>	
<i>Carex hoodii</i>	5.00
<i>Agrostis stolonifera</i>	3.00
<i>Equisetum arvense/Geranium richardsonii</i>	3.00
TOTAL COVER (Upland Species)	14.00
TOTAL COVER (Riparian Species)	11.00
ROCK (channel)	0.00
WATER (channel)	8.00
BAREGROUND (channel)	0.00
LITTER	0.00
MOSS	0.00
<hr/> TOTAL COVER <hr/>	<hr/> 33.00 <hr/>

PHOTOGRAPHIC DOCUMENTATION



WQ-09



Date: 3/26/2012

CLIENT: Canyon Fuel Company, LLC.
Project: Skyline Utah#6
Lab Order: S1203278

CASE NARRATIVE
Report ID: S1203278001

Sample WR2011-8 was received on March 21, 2012.

Samples were analyzed using the methods outlined in the following references:

- U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
- American Society of Agronomy, Number 9, Part 2, 1982
- USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
- Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
- New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
- State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
- Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
- State of Nevada Modified Sobek Procedure
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Karen A Secor



Soil Analysis Report
Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1203278001

Date Reported: 3/26/2012

Work Order: S1203278

Project: Skyline Utah#6

Date Received: 3/21/2012

Lab ID	Sample ID	pH	Saturation	Electrical Conductivity	Field Capacity	Wilt Point	PE Calcium	PE Magnesium	PE Potassium	PE Sodium	SAR
		s.u.	%	dS/m	%	%	meq/L	meq/L	meq/L	meq/L	
S1203278-001	WR2011-8	8.8	35.1	1.73	24.9	9.9	1.73	1.21	0.55	18.3	15.1

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1203278001

Date Reported: 3/26/2012

Work Order: S1203278

Project: Skyline Utah#6

Date Received: 3/21/2012

Lab ID	Sample ID	Sand	Silt	Clay	Texture	Coarse Fragment	Boron	Nitrate (as N)	Selenium	TKN
		%	%	%		%	ppm	ppm	ppm	%
S1203278-001	WR2011-8	71.0	21.0	8.0	Sandy Loam	39.6	0.47	<0.1	<0.02	0.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1203278001

Project: Skyline Utah#6

Date Reported: 3/26/2012

Date Received: 3/21/2012

Work Order: S1203278

Lab ID	Sample ID	Available	Exchangeable	Total		Total	T.S.	Neutral.	T.S.
		Sodium	Sodium	Carbon	TOC	Sulfur	AB	Potential	ABP
		meq/100g	meq/100g	%	%	%	t/1000t	t/1000t	t/1000t
S1203278-001	WR2011-8	3.46	2.82	37.8	36.3	0.67	21.0	120	99.2

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Inter-Mountain Labs

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Soil Analysis Report

Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1110307001

Project: Skyline Utah#6

Date Received: 10/17/2011

Date Reported: 12/1/2011

Work Order: S1110307

Lab ID	Sample ID	pH s.u.	Saturation %	Electrical Conductivity dS/m	Field Capacity %	Wilt Point %	PE Calcium meq/L	PE Magnesium meq/L	PE Potassium meq/L	PE Sodium meq/L	SAR
S1110307-001	WR2011-1	8.2	36.9	0.77	32.3	9.7	5.76	2.93	0.18	0.97	0.47
S1110307-002	WR2011-2	8.0	36.6	0.99	28.5	8.7	5.59	4.10	0.20	3.27	1.49
S1110307-003	WR2011-3	7.9	37.5	1.45	31.4	10.9	7.10	5.10	0.19	7.05	2.86
S1110307-004	WR2011-4	8.0	33.8	0.38	25.6	10.3	2.60	0.88	0.15	0.78	0.59
S1110307-005	WR2011-5	8.0	30.2	0.26	24.9	8.6	1.53	0.48	0.08	0.56	0.56
S1110307-006	WR2011-6	7.9	39.0	0.88	29.9	9.0	6.12	3.87	0.20	1.69	0.76
S1110307-007	WR2011-7	7.8	37.8	0.79	31.8	10.1	5.48	4.08	0.17	0.92	0.42

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2SO4= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1110307001

Project: Skyline Utah#6

Date Received: 10/17/2011

Date Reported: 12/1/2011

Work Order: S1110307

Lab ID	Sample ID	Coarse				Nitrate		TKN			
		Sand %	Silt %	Clay %	Texture	Fragment %	Boron ppm		(as N) ppm	Phosphorus ppm	Selenium ppm
S1110307-001	WR2011-1	67.0	23.0	10.0	Sandy Loam	38.0	0.77	0.2	9.25	<0.02	0.17
S1110307-002	WR2011-2	69.0	21.0	10.0	Sandy Loam	45.3	0.95	0.2	10.8	<0.02	0.18
S1110307-003	WR2011-3	64.0	24.0	12.0	Sandy Loam	36.5	0.88	0.7	11.8	<0.02	0.28
S1110307-004	WR2011-4	55.0	29.0	16.0	Sandy Loam	26.4	0.18	0.4	62.8	<0.02	0.08
S1110307-005	WR2011-5	61.0	25.0	14.0	Sandy Loam	40.8	0.15	0.2	11.0	<0.02	0.09
S1110307-006	WR2011-6	66.0	24.0	10.0	Sandy Loam	37.7	0.78	0.2	30.5	<0.02	0.20
S1110307-007	WR2011-7	65.0	25.0	10.0	Sandy Loam	34.0	0.81	0.1	16.1	<0.02	0.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral, Pot.= Neutralization Potential.

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

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

HCR 35, Box 380
Helper, UT 84526

Report ID: S1110307001

Project: Skyline Utah#6

Date Reported: 12/1/2011

Date Received: 10/17/2011

Work Order: S1110307

Lab ID	Sample ID	Available Sodium		Exchangeable Sodium		Total Carbon		Total Sulfur		T.S. AB		Neutral. Potential		T.S. ABP	
		meq/100g	meq/100g	meq/100g	meq/100g	%	%	%	%	i/1000t	AB	i/1000t	Potential	i/1000t	ABP
S1110307-001	WR2011-1	0.14	0.11	0.11	0.11	18.1	16.2	0.18	0.18	5.56	5.56	160	154		
S1110307-002	WR2011-2	0.33	0.21	0.21	0.21	18.2	15.2	0.18	0.18	5.62	5.62	249	244		
S1110307-003	WR2011-3	0.81	0.54	0.54	0.54	19.4	17.8	0.16	0.16	4.99	4.99	130	125		
S1110307-004	WR2011-4	0.08	0.05	0.05	0.05	0.9	0.2	<0.01	<0.01	<0.01	<0.01	55.3	55.3		
S1110307-005	WR2011-5	0.06	0.04	0.04	0.04	1.0	0.3	<0.01	<0.01	<0.01	<0.01	62.9	62.9		
S1110307-006	WR2011-6	0.20	0.13	0.13	0.13	19.0	16.9	0.19	0.19	5.86	5.86	182	176		
S1110307-007	WR2011-7	0.13	0.09	0.09	0.09	19.5	17.5	0.16	0.16	5.11	5.11	167	162		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

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

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor

Print Form

Submit by Email

Reset Form

Annual Report

This Annual Report shows information the Division has for your mine. Submit the completed document and any additional information identified in the Appendices to the Division by **March 30, 2012**. During a complete inspection an inspector will check and verify the information.

GENERAL INFORMATION

Company Name	Canyon Fuel Company LLC	Mine Name	Skyline Mine
Permit Number	C/007/0005	Permit expiration Date	April 30, 2012
Operator Name	Canyon Fuel Company, LLC	Phone Number	+1 (435) 448-2619
Mailing Address	HC 35 Box 380	Email	ggalecki@archcoal.com
City	Helper		
State	Utah	Zip Code	84526

DOG M File Location or Annual Report Location

Excess Spoil Piles	<input type="checkbox"/> Required <input checked="" type="checkbox"/> Not Required	
Refuse Piles	<input checked="" type="checkbox"/> Required <input type="checkbox"/> Not Required	Submitted electronically via email on the following dates for the respective quarters: 4/15/11 1st Qtr; 6/22/11 2nd Qtr; 11/1/11 3rd Qtr; 1/9/12 4th Qtr.
Impoundments	<input checked="" type="checkbox"/> Required <input type="checkbox"/> Not Required	Submitted electronically via email on the following dates for the respective quarters: 4/15/11 1st Qtr; 6/22/11 2nd Qtr; 11/1/11 3rd Qtr; 1/9/12 4th Qtr.
Other:		

OPERATOR COMMENTS

REVIEWER COMMENTS Met Requirements Did Not meet Requirements

COMMITMENTS AND CONDITIONS

The Permittee is responsible for ensuring annual technical commitments in the Mining and Reclamation Plan and conditions accepted with the permit are completed throughout the year. The Division has identified these commitments below and has provided space for you to report what you have done during the past year for each commitment. If additional written response is required, it should be filed as an attachment to this report.

Title: WASTE ROCK SAMPLING

Objective: To document chemical characteristics and support reclamation plan using less than four feet of cover and to protect surface and groundwater.

Frequency: During periods of deposition at the waste rock site.

Status: Quarterly sampling, one sample per 2000 tons hauled to the disposal site.

Reports: Annual report

Citation: MRP, Volume 3, Section 4.4, page 4-30, 2nd paragraph and 1988 Soils Guidelines Table 6.

Operator Comments

Samples WR2011-1 through WR2011-8 were submitted using CD format in March 2012.

Reviewer Comments Met Requirements Did Not Meet Requirements

Title: NORTH LEASE PERENNIAL STREAM FLOW MEASUREMENT

Objective: To evaluate the impact of longwall mining on perennial portions of streams in Winter Quarters and Woods Canyons.

Frequency: Monthly, June through October and when accessible, one year prior to, during and one year after undermining.

Status: Ongoing

Reports: Quarterly to database. Submit updates to drawing 2.3.6-2 annually to show the relationship of these monitoring points to the progress of the longwall operation.

Citation: MRP, Volume 1A, Page 2-44a, paragraph 5.

Operator Comments

Information is submitted electronically on a quarterly basis to the Division database.

Reviewer Comments Met Requirements Did Not Meet Requirements

Title: MACROINVERTEBRATE SURVEYS

Objective: To determine if mining and mining related activities are impacting the perennial streams located in Woods, Eccles, Burnout and James Canyons.

Frequency: Fall and Spring every three years beginning in 2007.

Status: 2007Fall and 2008 Spring reports Complete. Next surveys due in fall 2011/ Spring 2012.

Reports: Annual -May be submitted in the 2012 annual report if write up is not complete.

Citation: MRP, Appendix A-3, Volume 2, Volume 1A, Section 2.8, pages 2-71, 71A, B,C. Section 2.8, table 2.8-1a

Operator Comments

Due to the amount of lab work necessary to identify and count all the macroinvertebrate species, the surveys were conducted but the reports have not been finalized at this time.

Reviewer Comments Met Requirements Did Not Meet Requirements

Title: NORTH LEASE VEGETATION SURVEY

Objective: To determine the effects of longwall mining on riparian vegetation along Winter Quarters and Woods Canyon stream channels.

Frequency: Baseline survey of entire length of channels in 2005. Survey two years prior and during undermining of channel lengths and follow-up surveys two years after undermining.

Status: Ongoing

Reports: Annual

Citation: MRP, Volume 1A, Section 2.7, pages 2-61d; A-2 volume 2, and A-3 Volume 2

Operator Comments

Submitted electronically using CD format in March 2012.

Reviewer Comments Met Requirements

Did Not Meet Requirements

Empty rectangular box for reviewer comments.



FUTURE COMMITMENTS AND CONDITIONS

The following commitments are not required for the current annual report year, but will be required by the permittee in the future as indicated by the "status" field. These commitments are included for information only, and do not currently require action. If you feel that the commitment is no longer relevant or needs to be revised, please contact the Division.

Title: FISH SURVEY

Objective: To determine if mining and mining related activities are impacting the perennial streams located in Eccles, and Winter Quarters. Woods, Burnout and James Canyon Surveys are complete.

Frequency: In the fall every three years beginning in 2007.

Status: 2010 surveys complete. Next survey due in 2013.

Reports: Annual

Citation: MRP, Volume 1A, Section 2.8, page 2-71.

Title: TOPSOIL SAMPLING

Objective: To determine fertilizer application rate.

Frequency: At final reclamation sample redistributed topsoil for N, P, K, Fe, Mg, Mn, Zn, Ca and pH.

Status: At final reclamation

Reports: None specified. Suggest verbal communication with Division and lab analyses to be included in bond release application.

Citation: MRP, Volume 3, Section 4.5, page 4-32, 2nd paragraph.

Title: SUBSOIL SAMPLING AT WASTE ROCK SITE

Objective: To provide chemical characteristics of purchased subsoil.

Frequency: Once. Sample purchased subsoil for parameters in Table 1 of the Utah 1988 Guidelines.

Status: Ongoing with contemporaneous reclamation at the waste rock site.

Reports: None specified. Suggest verbal communication with Division and lab analysis to be included in bond release application.

Citation: MRP, Volume 3, Section 4.6.4.1, page 4-38a, 3rd paragraph, and page 4-38b.

Title: AGE-MONITORING OF WATER

Objective: To understand the possible sources of groundwater inflows.

Frequency: When inflows of 800 gpm are encountered.

Status: No significant inflows in the North Lease.

Reports: Immediately notify Division

Citation: MRP, Volume 1, page 2-35b, paragraph 2.

Title: SAMPLING PRIOR TO SLURRY PLACEMENT IN ABANDONED UNDERGROUND WORKINGS

Objective: Protection of groundwater

Frequency: Every 450 feet of advance

Status: Report if placed slurry in abandoned underground workings.

Reports: Notification if parameters are out of compliance with Guidelines for Topsoil and Overburden.

Citation: MRP, Volume 2, Incorporation of 97K-1 and Section 1.2 (at the end of section 3.2).

Title: SAMPLING OF WASTE ROCK IN TEMPORARY STOCKPILES

Objective: Protection of surface and groundwater

Frequency: one sample per 2000 tons of temporary stockpiled material if remains in temporary location longer than three months.

Status: Ongoing

Reports: Not specified. Assumed to be the same as disposal site sampling (previous paragraph on same page.)

Citation: MRP, Volume 3, page 4-30, 3rd paragraph, and 1988 Soils guidelines, table 6.

OPERATOR COMMENTS (OPTIONAL)

Soil sample analysis for material deposited at the Waste Rock site have been submitted electronically using CD format in March 2012.

REVIEWER COMMENTS

REPORTING OF OTHER TECHNICAL DATA

Please list other technical data or information that was not included in the form above, but is required under the approved plan, which must be periodically submitted to the Division.

Please list attachments:

A Comparison of the Plant Communities Using Color Infrared Aerial Photographs for the North Lease Area 2005-2011; Mt. Nebo Scientific - submitted electronically using CD format in March 2012

Skyline Mine Subsidence Raptor Survey 2011; Western Land Services, Inc. July 25, 2011 - Submitted electronically using CD format in March 2012

Reviewer Comments

