Canyon Fuel Company, LLC
Skyline Mines
C/007/005

2004 Annual Report

File in:
- ☐ Confidential
- ☐ Shelf
- ☒ Expandable

Refer to Record No. 0033 Date 03/3/2005
In C/0070005 Incoming
For additional information

*To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the **tab** key to move from one field to the next. To select a check box, click in the box or type an x.*

GENERAL INFORMATION

Permitte Name	Canyon Fuel Company
Mine Name	Skyline Mine
Operator Name (If other then permittee)	
Permit Expiration Date	April 30, 2007
Permit Number	C/007/005
Authorized Representative Title	Wess Sorensen
Phone Number	(435) 448-2619
Fax Number	(435) 448-2632
E-mail Address	wsorensen@archcoal.com
Mailing Address	Skyline Mine HCR 35 Box 380 Helper, UT 84526
Designated Representative	Gregg Galecki
Resident Agent	Corporation Trust Company
Resident Agent Mailing Address	Corporation Trust Company 1209 Orange Street Wilmington, DE
Number of Binders Submitted	2

IDENTIFICATION OF OTHER PERMITS

Identify other permits that are required in conjunction with mining and reclamation activities.

Permit Type	ID Number	Description	Expiration Date
MSHA Mine ID(s)	1211-UT-09-01566-01	Skyline Mine	N/A
	1211-UT-09-01566-02	Skyline Mine Waste Rock Disposal Site	N/A
MSHA Impoundment(s)	None		
NPDES/UPDES Permit(s)	UT 0023540-01, 02, 03	UPDES Permit for Skyline Mine, Rail	11/30/09
		Loadout, Waste Rock Disposal Site	
PSD Permit(s) (Air)	147-98	Approval Order	N/A

Other

MSHA Mine ID(s)	1211-UT-09-01566-03	Skyline Mine Temporary Waste Rock	N/A
		Disposal Site	
Storm Water Permit	UTR000578	Storm Water Discharge Permit	12/01/06

CERTIFIED REPORTS

List the certified inspection reports as required by the rules and udder the approved plan that must be periodically submitted t the Division. Specify whether the information is included as Appendix A to this report or currently on file with the Division.

Certified Reports:	Required		Included or on file with DOGM		Comments
	Yes	No	Included	On File	
Excess Spoil Piles	☐	☒	☐	☐	
Refuse Piles	☒	☐	☒	☐	Appendix A
Impoundments	☒	☐	☒	☐	Appendix A
Other					
	☐	☐	☐	☐	

REPORTING OF OTHER TECHNICAL DATA

List other technical data and information as required under the approved plan, which must be periodically submitted to the Division. Specify whether the information is included as Appendix B to this report or currently on file with the Division.

Technical Data:	Required		Included or on file with DOGM		Comments
	Yes	No	Included	On file	
Climatological	☐	☒	☐	☐	
Subsidence Monitoring	☒	☐	☒	☐	Appendix B
Vegetation Monitoring	☒	☐	☒	☐	Appendix B
Raptor Survey	☒	☐	☐	☒	
Soils Monitoring	☐	☒	☐	☐	
Water Monitoring	☒	☐	☐	☒	
First quarter	☒	☐	☐	☒	
Second quarter	☒	☐	☐	☒	
Third quarter	☒	☐	☐	☒	
Fourth quarter	☒	☐	☐	☒	
Geological / Geophysical	☐	☒	☐	☐	
Engineering	☐	☒	☐	☐	
Non Coal Waste / Abandoned Underground Equipment*	☒	☐	☐	☒	
Other Data					
EarthFax WinterQtr/Woods Studies	☒	☐	☐	☒	Submitted in July 2004
Rip. Surv. Winter Qtrs/Woods	☒	☐	☐	☒	Submitted in July 2004
Macro- '02,'03, Winter Qtr./Woods	☒	☐	☐	☒	Submitted in July 2004
Macro – Eccles Fall '03	☒	☐	☒	☐	Appendix B
Macro – James / Burnout Spring '03	☒	☐	☒	☐	Appendix B

*Reminder: If equipment has been abandoned during 2004, an amendment must be submitted that includes a map showing its location, a description of what was abandoned, whether there were any hazardous or toxic materials and any

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

Change in administration or corporate structure can often bring about necessary changes to information found in the mining and reclamation plan. The Division is Requesting that each permittee review and update the legal, financial, compliance and related information in the plan as part of the annual report. Please provide the Department of Commerce, Annual Report of Officers, or other equivalent information as necessary to ensure that the information provided in the plan is current. Provide any other change as necessary regarding land ownership, lease acquisitions, legal results from appeals of violations, or other changes as necessary to update information required in the mining and reclamation plan. Include certified financial statements, audits or worksheets, which may be required to meet bonding requirements. Specify whether the information is currently on file with the Division or included as Appendix C to the report.

Legal / Financial Update	Required		Included or on File with DOGM		Comments
	Yes	No	Included	On file	
Department of Commerce, Annual Report Officers	☐	☒	☐	☐	
Other					
Officers and Directors - General Chapter 1	☒	☐	☐	☒	Submitted in February 2005
	☐	☐	☐	☐	
	☐	☐	☐	☐	

MINE MAPS

Copies of mine maps, current and up-to-date through at least December 31, 2004, are to be provided to the Division as Appendix D to this report in accordance with the requirements of R 645-301-525.240. These map copies shall be made in accordance with 30 CFR 75.1200 as required by MSHA. Upon request, the Division shall keep mine maps confidential. Please provide a CD.

Map Number(s)	Map Title/ Description	Confidential Yes	Confidential No
	Skyline Mine, Mine 3 Levels 2 and 3, 2004 As-Mined	☒	☐
	Cumulative Subsidence 1982 to 2004	☐	☒
	Skyline Mine Projected Mining 2005 - 2014	☒	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

OTHER INFORMATION

Please provide any comments of further information to be included as part of the Annual Report. Any other attachments are to be provided as Appendix E to this report. If information is submitted as a group rather then by individual mine, please identify each of the mine's data in the list below.

Additional attachment to this report? **Yes** ☐ **No** ☒

APPENDIX A

Certified Reports

Excess Spoil Piles
Refuse Piles
Impoundments

As required under R645-301-514

CONTENTS

Waste Rock Inspections
Sediment Pond Annual Inspection

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE			
Permit Number	C/007/005	**Report Date**	May 7, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company, LLC		
Excess Spoil Pile or Refuse Pile Identification	**Pile Name**	Skyline Waste Rock Site	
	Pile Number	NA	
	MSHA ID Number	42-01566	
Inspection Date	March 26, 2004		
Inspected By	Carl Winters		
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)		Quarterly	
		Attachments to Report? ✗ **No** ☐ **Yes**	

Field Evaluation

1. Foundation preparation, including the removal of all organic material and topsoil.

Topsoil removal and foundation preparation was completed several years prior to the most recent placement of material.

2. Placement of underdrains and protective filter systems.

No underdrains are present or required at this site.

3. Installation of final surface drainage systems.

Existing surface is not at final contour. Therefore, final surface drainages have not yet been constructed. All surface runoff from the refuse pile is treated by the sediment pond. Runoff from the main access road below the sediment pond is treated by straw bale dikes.

4. Placement and compaction of fill materials.

No gob was hauled to the site during this quarter. The site was inaccessible for almost the entire first quarter of 2004 because of snow.

5. Final grading and revegetation of fill.

Contemporaneous reclamation of the waste rock pile is taking place as the site is backfilled with waste rock. The backfill slopes are built to 1 1/2h:1v or less and seeded as described in the final reclamation plan. The seed mix specified in the Reclamation Plan is planted after the placement of topsoil.

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE		

6. **Appearances of instability, structural weakness, and other hazardous conditions.**

No instability or structural weakness we noted during the inspection. Most of the snow had disappeared from the site with the exception of the east half of the top of the waste rock pile. The berms on the outside edge of the access road may need to be increased in size to comply with MSHA requirements.

7. **Other Comments. Describe any changes in the geometry of the Excess Spoil/Refuse Pile structure, instrumentation, average and maximum lifts of materials placed in the pile, elevations of active benches, total and remaining storage capacity of the structure, evidence of fires in the pile and abatement of such fires, volumes of materials placed in the structure during the year, and any other aspect of the structure affecting its stability or function which has occurred during the reporting period.**

The pile has a remaining storage capacity of approximately 25,402 tons. The current total storage capacity as designed is 334,125.

Certification Statement

I hereby certify that; I am experienced in the construction of earth and rock fills; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of earth and rock fills in accordance with the certified and approved designs for this structure; that the fill structure has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

(Cert. Stamp)

REGISTERED PROFESSIONAL ENGINEER
CARL
W
WINTERS
NO 22 157958-2202
STATE OF UTAH

By: Carl W. Winters - Business Manager
(Full Name and Title)

Signature: Carl W. Winters **Date:** May 7, 2004

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE			
Permit Number	C/007/005	**Report Date**	September 9, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company, LLC		
Excess Spoil Pile or Refuse Pile Identification	**Pile Name**	Skyline Waste Rock Site	
	Pile Number	NA	
	MSHA ID Number	42-01566	
Inspection Date	June 22, 2004		
Inspected By	Carl Winters		
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)		Quarterly	
		Attachments to Report? Ξ No 9 Yes	

Field Evaluation

1. Foundation preparation, including the removal of all organic material and topsoil.

Topsoil removal and foundation preparation was completed several years prior to the most recent placement of material.

2. Placement of underdrains and protective filter systems.

No underdrains are present or required at this site.

3. Installation of final surface drainage systems.

Existing surface is not at final contour. Therefore, final surface drainages have not yet been constructed. All surface runoff from the refuse pile is treated by the sediment pond. Runoff from the main access road below the sediment pond is treated by straw bale dikes. The site sediment pond is scheduled for sediment cleanout in the third quarter of this year. The sediment level in the pond is well below the required sediment removal level.

4. Placement and compaction of fill materials.

No gob was hauled to the site during this quarter.

5. Final grading and revegetation of fill.

Contemporaneous reclamation of the waste rock pile is taking place as the site is backfilled with waste rock. The backfill slopes are built to 1 1/2h:1v or less and seeded as described in the final reclamation plan. The seed mix specified in the Reclamation Plan is planted after the placement of topsoil.

6. **Appearances of instability, structural weakness, and other hazardous conditions.**

No instability or structural weakness was noted during the inspection.

7. **Other Comments. Describe any changes in the geometry of the Excess Spoil/Refuse Pile structure, instrumentation, average and maximum lifts of materials placed in the pile, elevations of active benches, total and remaining storage capacity of the structure, evidence of fires in the pile and abatement of such fires, volumes of materials placed in the structure during the year, and any other aspect of the structure affecting its stability or function which has occurred during the reporting period.**

The pile has a remaining storage capacity of approximately 25,402 tons. The current total storage capacity as designed is 334,125.

Certification Statement

I hereby certify that; I am experienced in the construction of earth and rock fills; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of earth and rock fills in accordance with the certified and approved designs for this structure; that the fill structure has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
STATE OF UTAH

[Cert. Stamp]

By: Carl W. Winters, Business Manager

(Full Name and Title)

Signature: Carl W. Winters **Date:** September 20, 2004

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE			
Permit Number	C/007/005	**Report Date**	September 20, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company, LLC		
Excess Spoil Pile or Refuse Pile Identification	**Pile Name**	Skyline Waste Rock Site	
	Pile Number	NA	
	MSHA ID Number	42-01566	
Inspection Date	September 20, 2004		
Inspected By	Carl Winters		
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)		Quarterly	
		Attachments to Report? Ξ No 9 Yes	

Field Evaluation

1. Foundation preparation, including the removal of all organic material and topsoil.

Topsoil removal and foundation preparation was completed several years prior to the most recent placement of material.

2. Placement of underdrains and protective filter systems.

No underdrains are present or required at this site.

3. Installation of final surface drainage systems.

Existing surface is not at final contour. Therefore, final surface drainages have not yet been constructed. All surface runoff from the refuse pile is treated by the sediment pond. Runoff from the main access road below the sediment pond is treated by straw bale dikes. The sediment pond was cleaned of sediment during July of this quarter. The sediment was placed in the waste rock pile and the area of placement re-shaped to preclude ponding of runoff water.

4. Placement and compaction of fill materials.

No gob was hauled to the site during this quarter.

5. Final grading and revegetation of fill.

Contemporaneous reclamation of the waste rock pile is taking place as the site is backfilled with waste rock. The backfill slopes are built to 1 1/2h:1v or less and seeded as described in the final reclamation plan. The seed mix specified in the Reclamation Plan is planted after the placement of topsoil.

6. **Appearances of instability, structural weakness, and other hazardous conditions.**

No instability or structural weakness was noted during the inspection.

Other Comments. Describe any changes in the geometry of the Excess Spoil/Refuse Pile structure, instrumentation, average and maximum lifts of materials placed in the pile, elevations of active benches, total and remaining storage capacity of the structure, evidence of fires in the pile and abatement of such fires, volumes of materials placed in the structure during the year, and any other aspect of the structure affecting its stability or function which has occurred during the reporting period.

The pile has a remaining storage capacity of approximately 25,402 tons. The current total storage capacity as designed is 334,125.

Certification Statement

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
STATE OF UTAH

[Seal Stamp]

I hereby certify that; I am experienced in the construction of earth and rock fills; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of earth and rock fills in accordance with the certified and approved designs for this structure; that the fill structure has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

By: Carl W. Winters, Business Manager

(Full Name and Title)

Signature: Carl W. Winters **Date:** September 21, 2004

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE			
Permit Number	C/007/005	Report Date	December 29, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company, LLC		
Excess Spoil Pile or Refuse Pile Identification	Pile Name	Skyline Waste Rock Site	
	Pile Number	NA	
	MSHA ID Number	42-01566	
Inspection Date	December 29, 2004 Site was inaccessible		
Inspected By	Carl Winters		
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly		
	Attachments to Report? ✗ No ☐ Yes		

Field Evaluation

The site was inaccessible due to the depth of snow cover. However, no significant problems with the waste site were observed during the 3rd quarter of this year and no material has been placed at the site during this quarter. It seems unlikely there has been any significant changes to the site since it was last inspected.

1. Foundation preparation, including the removal of all organic material and topsoil.

Topsoil removal and foundation preparation was completed several years prior to the most recent placement of material.

2. Placement of underdrains and protective filter systems.

No underdrains are present or required at this site.

3. Installation of final surface drainage systems.

Existing surface is not at final contour. Therefore, final surface drainages have not yet been constructed. All surface runoff from the refuse pile is treated by the sediment pond. Runoff from the main access road below the sediment pond is treated by straw bale dikes. The sediment pond was cleaned of sediment during July of this year. The sediment was placed in the waste rock pile and the area of placement re-shaped to preclude ponding of runoff water.

4. Placement and compaction of fill materials.

No gob was hauled to the site during this quarter.

5. Final grading and revegetation of fill.

Contemporaneous reclamation of the waste rock pile is taking place as the site is backfilled with waste rock. The backfill slopes are built to 1 1/2h:1v or less and seeded as described in the final reclamation plan. The seed mix specified in the Reclamation Plan is planted after the placement of topsoil.

INSPECTION AND CERTIFIED REPORT ON EXCESS SPOIL PILE OR REFUSE PILE		

6. **Appearances of instability, structural weakness, and other hazardous conditions.**

No instability or structural weakness was noted during the 3rd quarter 2004 inspection. The site was inaccessible at the time of this quarter's inspection.

7. **Other Comments. Describe any changes in the geometry of the Excess Spoil/Refuse Pile structure, instrumentation, average and maximum lifts of materials placed in the pile, elevations of active benches, total and remaining storage capacity of the structure, evidence of fires in the pile and abatement of such fires, volumes of materials placed in the structure during the year, and any other aspect of the structure affecting its stability or function which has occurred during the reporting period.**

The pile has a remaining storage capacity of approximately 25,402 tons. The current total storage capacity as designed is 334,125.

Certification Statement

I hereby certify that; I am experienced in the construction of earth and rock fills; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of earth and rock fills in accordance with the certified and approved designs for this structure; that the fill structure has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

REGISTERED PROFESSIONAL ENGINEER
[Cert. Stamp]
CARL W WINTERS
NO 22 157968-2202
12-30
STATE OF UTAH

By: Carl W. Winters
Operations Support Mgr - Skyline Mine
(Full Name and Title)

Signature: Carl W. Winters Date: 30 Dec 2004

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	**Report Date**	April 9, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	**Impoundment Name**	Mine Site Sediment Pond	
	Impoundment Number	001	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	March 26, 2003
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No signs of instability were observed. No hazardous conditions were observed during the inspection of the pond.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 72,658 ft^3
60% Elevation: 8568.5 feet ASL (above sea level)
100% Elevation: 8571.5 feet ASL
The current elevation of the sediment within the pond at the discharge point was approximately 8,567.0 ft ASL (21,797 ft^3). At this elevation, approximately 70% of the storage volume remains. The remaining sediment volume storage capacity is approximately 50,861 ft^3.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillway Elevations: 8579.6 feet ASL (The outlet structure for Pond 001 serves as both the Principal and Emergency Spillways)

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT

Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Water elevation at the time of inspection was 8579.62 feet ASL (0.02 feet above discharge elevation) and was discharging about 25 gpm. A sample of the mine discharge water has been taken on weekly basis throughout the quarter as required by the mine's UPDES permit. On a biweekly basis the water sample is analyzed for total iron and total dissolved solids. Weekly samples include oil and grease, total suspended solids, pH and conductivity.

Surface water is collected from the upper mine pad and discharged to the pond through a culvert located on the west end of the pond. The culvert appeared to be functioning as designed. The outlet structure was working as designed and appeared to be in good working condition.

A small area on the north side of the pond has a colony of cattails. The colony poses no threat to the operation of the pond.

The pond was cleaned of most of its sediment in October 2003.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The overall geometry of the pond does not appear to have been modified this quarter. The pond has almost continually discharged this quarter; therefore the minimum elevation has been no less than 8579.6. Flow depth above the level of the discharge pipe can vary between less than 0.01 and 0.26 feet. Total storage volume for water and sediment combined is 179,014 ft^3 (4.1 ac-ft).

Based on the estimated volume of sediment, the estimated volume of water in the pond is 157,217 ft^3 (3.61 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Chad D. Hansen **Date:** 4-9-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	April 9, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Rail Loadout Sediment Pond	
	Impoundment Number	002	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	March 26, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability of the embankment was noted during the inspection. No hazardous conditions were noted at the time of the inspection. Ice covered portions of the pond. The ice was covered with some coal fines.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 54,710 ft^3
60% Elevation: 7915.0 feet ASL (above sea level)
100% Elevation: 7915.6 ASL
Current Sediment Level Elevation: 7915.0 feet ASL (at 60 % level). This number is based on the volume reported in the 3rd Quarter of 2003. The sediment pond was cleaned of sediment in the last week of October 2003. Therefore, the elevation of sediment is probably less than 7915.6. However, since the pond surface was covered with ice, a determination of sediment elevation was not possible.

3. Principle and emergency spillway elevations.

Principle Spillway Elevation: 7919.7 feet ASL
Emergency Spillway Elevation: 7922 feet ASL

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Current water/ice surface elevation is 7,919.68 feet ASL

The pond was not discharging at the time of the inspection though it has discharged this month. The pond has not been decanted since July 2000. The pond embankment appears stable and without noticeable erosion. Vegetation growing on the embankment and outslopes does not appear to create hazardous conditions.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The geometry of the pond does not appear to have changed recently. The sediment volume in the pond, based on the 2003 3rd quarter inspection, was estimated to be 32,826 ft^3 with a remaining sediment storage capacity of 21,884 ft^3. The water level at the time of the inspection was 7,919.68 ft ASL. The maximum elevation was about 7,919.8.

Total storage capacity of water and sediment combined is 95,380 ft^3 (2.2 ac-ft). Assuming the sediment volume is approximately 32,826 ft^3, the estimated total water capacity remaining in the pond is approximately 62,554 ft^3 (1.43 ac-ft). However, it should be noted that the pond was cleaned of sediment in October 2003. A confirmation of the sediment elevation was not possible at the time of the inspection.

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** [illegible] **Date:** 4-09-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	April9, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Waste Rock Site Sediment Pond	
	Impoundment Number	003	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	March 26, 2004
Inspected By	Carl Winters
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability was noted at the site during the visit.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 6906 ft^3
60% Elevation: 7860.8 feet ASL (above sea level)
100% Elevation: 7861.3 ASL
Current Sediment Level Elevation: The only sediment noted in the pond at the time of the inspection was the small delta that has formed on the east end of pond. At the time of the inspection, there was only a small puddle of water present in the lowest portion of the pond.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillways Elevation: 7865.5 feet ASL (The outlet of Pond 003 serves as both the principal and emergency spillway).

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

This pond did not discharge in the first quarter of 2004, therefore no water samples were obtained. The pond had minimal water in it at the time of the inspection. Water occupied only the lowest-most portion of the pond. The vegetation on the out slopes of the pond embankment do not appear to present any type of hazardous conditions. No instability was noted in the pond embankment.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

No changes have been noted in the geometry of the pond since the last inspection. The pond has evidently held very little water. The pond appears to have at least 90% of its sediment storage capacity remaining. The estimated volume of water in the pond at the time of the inspection was less than 0.02 acre-feet.

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Chad Hanna **Date:** 4-09-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	July 7, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Mine Site Sediment Pond	
	Impoundment Number	001	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	June 23, 2003
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No signs of instability were observed. No hazardous conditions were observed during the inspection of the pond.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 72,658 ft^3
60% Elevation: 8568.5 feet ASL (above sea level)
100% Elevation: 8571.5 feet ASL
The current elevation of the sediment within the pond at the discharge point was approximately 8,567.0 ft ASL (21,797 ft^3). At this elevation, approximately 70% of the storage volume remains. The remaining sediment volume storage capacity is approximately 50,861 ft^3. This volume has apparently not changed since the last quarter.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillway Elevations: 8579.6 feet ASL (The outlet structure for Pond 001 serves as both the Principal and Emergency Spillways)

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT		

Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Water elevation at the time of inspection was 8579.60 feet ASL with less than 1 gpm discharging. A sample of the mine discharge water has been taken on weekly basis throughout the quarter as required by the mine's UPDES permit. On a biweekly basis the water sample is analyzed for total iron and total dissolved solids. Weekly samples include oil and grease, total suspended solids, pH and conductivity.

Surface water is collected from the upper mine pad and discharged to the pond through a culvert located on the west end of the pond. The culvert appeared to be functioning as designed. The outlet structure was working as designed and appeared to be in good working condition.

A small area on the north side of the pond has a colony of cattails. The colony poses no threat to the operation of the pond.

The pond was cleaned of most of its sediment in October 2003.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The overall geometry of the pond does not appear to have been modified this quarter. The pond has almost continually discharged this quarter but at a very low rate; therefore the minimum elevation has been no less than 8579.6. Flow depth above the level of the discharge pipe can vary between less than 0.01 and 0.26 feet. Total storage volume for water and sediment combined is 179,014 ft^3 (4.1 ac-ft).

Based on the estimated volume of sediment, the estimated volume of water in the pond is 157,217 ft^3 (3.61 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. Signature: [illegible] Date: 7-2-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	July 7, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Rail Loadout Sediment Pond	
	Impoundment Number	002	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	June 23, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability of the embankment was noted during the inspection. No hazardous conditions were noted at the time of the inspection. Ice covered portions of the pond. The ice was covered with some coal fines.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 54,710 ft^3
60% Elevation: 7915.0 feet ASL (above sea level)
100% Elevation: 7915.6 ASL
Current Sediment Level Elevation: 7914.8 feet ASL. The sediment pond was cleaned of sediment in the last week of October 2003.

3. Principle and emergency spillway elevations.

Principle Spillway Elevation: 7919.7 feet ASL
Emergency Spillway Elevation: 7922 feet ASL

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Current water/ice surface elevation is 7,919.12 feet ASL

The pond was not discharging at the time of the inspection and has not discharged this quarter. The pond has not been decanted since October 2003. The pond embankment appears stable and without noticeable erosion. Vegetation growing on the embankment and outslopes does not appear to create hazardous conditions.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The geometry of the pond does not appear to have changed recently. The sediment volume in the pond was estimated to be 25,531 ft^3 with a remaining sediment storage capacity of 29,179 ft^3. The water level at the time of the inspection was 7,919.12 ft ASL. The maximum elevation was about 7,919.6.

Total storage capacity of water and sediment combined is 95,380 ft^3 (2.2 ac-ft). Assuming the sediment volume is approximately 29,179 ft^3, the estimated total water capacity remaining in the pond is approximately 66,201 ft^3 (1.52 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. Signature: [signature] Date: 7-7-04

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	July 7, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Waste Rock Site Sediment Pond	
	Impoundment Number	003	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	June 23, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability was noted at the site during the visit.

Required for an impoundment which functions as a SEDIMENTATION POND.	**2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.** Sediment Storage Capacity: 6906 ft^3 60% Elevation: 7860.8 feet ASL (above sea level) 100% Elevation: 7861.3 ASL Current Sediment Level Elevation: The only sediment noted in the pond at the time of the inspection was the small delta that has formed on the east end of pond. At the time of the inspection, there was only a small puddle of water present in the lowest portion of the pond.
	3. Principle and emergency spillway elevations. Principal and Emergency Spillways Elevation: 7865.5 feet ASL (The outlet of Pond 003 serves as both the principal and emergency spillway).

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

This pond did not discharge in the first quarter of 2004, therefore no water samples were obtained. The pond had minimal water in it at the time of the inspection. Water occupied only the lowest-most portion of the pond. The vegetation on the out slopes of the pond embankment do not appear to present any type of hazardous conditions. No instability was noted in the pond embankment.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

No changes have been noted in the geometry of the pond since the last inspection. The pond has evidently held very little water. The pond appears to have at least 90% of its sediment storage capacity remaining. The estimated volume of water in the pond at the time of the inspection was less than 0.02 acre-feet.

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** [illegible] **Date:** 7-7-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	September 28, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Mine Site Sediment Pond	
	Impoundment Number	001	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	September 28, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No signs of instability were observed. No hazardous conditions were observed during the inspection of the pond.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 72,658 ft^3
60% Elevation: 8568.5 feet ASL (above sea level)
100% Elevation: 8571.5 feet ASL
The current elevation of the sediment within the pond at the discharge point was approximately 8,567.0 ft ASL (21,797 ft^3), no significant change from last quarter. At this elevation, approximately 70% of the storage volume remains. The remaining sediment volume storage capacity is approximately 50,861 ft^3. This volume has apparently not changed since the last quarter.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillway Elevations: 8579.6 feet ASL (The outlet structure for Pond 001 serves as both the Principal and Emergency Spillways)

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT		

4. **Field Information.** Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Water elevation at the time of inspection was 8579.50 feet ASL with no discharge occurring. A sample of the mine discharge water has been taken, if discharging, on weekly basis throughout the quarter as required by the mine's UPDES permit. On a biweekly basis the water sample is analyzed for total iron and total dissolved solids. Weekly samples include oil and grease, total suspended solids, pH and conductivity.

Surface water is collected from the upper mine pad and discharged to the pond through a culvert located on the west end of the pond. The culvert appeared to be functioning as designed. The outlet structure was working as designed and appeared to be in good working condition.

A small area on the north side of the pond has a colony of cattails. The colony poses no threat to the operation of the pond.

The pond was cleaned of most of its sediment in October 2003.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The overall geometry of the pond does not appear to have been modified this quarter. The pond has rarely discharged this quarter and only at a very low rate. The minimum elevation has been approximately 8579.0. Flow depth above the level of the discharge pipe can vary between less than 0.00 and 0.26 feet. Total storage volume for water and sediment combined is 179,014 ft^3 (4.1 ac-ft).

Based on the estimated volume of sediment, the estimated volume of water in the pond is 157,217 ft^3 (3.61 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. Signature: Chad D. Hansen Date: 9-28-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	September 28, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Rail Loadout Sediment Pond	
	Impoundment Number	002	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	September 28, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability of the embankment was noted during the inspection. No hazardous conditions were noted at the time of the inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 54,710 ft^3
60% Elevation: 7915.0 feet ASL (above sea level)
100% Elevation: 7915.6 ASL
Current Sediment Level Elevation: 7914.8 feet ASL. The sediment pond was cleaned of sediment in the last week of October 2003.

3. Principle and emergency spillway elevations.

Principle Spillway Elevation: 7919.7 feet ASL
Emergency Spillway Elevation: 7922 feet ASL

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Current water surface elevation is 7,915.0 feet ASL

The pond was not discharging at the time of the inspection and has not discharged this quarter. The pond has not been decanted since October 2003. The pond embankment appears stable and without noticeable erosion. Vegetation growing on the embankment and outslopes does not appear to create hazardous conditions.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The geometry of the pond does not appear to have changed recently. The sediment volume in the pond was estimated to be 25,531 ft^3 with a remaining sediment storage capacity of 29,179 ft^3. The water level at the time of the inspection was 7,915.0 ft ASL. The maximum elevation was about 7,918.0.

Total storage capacity of water and sediment combined is 95,380 ft^3 (2.2 ac-ft). Assuming the sediment volume is approximately 29,179 ft^3, the estimated total water capacity remaining in the pond is approximately 66,201 ft^3 (1.52 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Chad D. Hansen **Date:** 9-28-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	September 28, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Waste Rock Site Sediment Pond	
	Impoundment Number	003	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	September 28, 2004
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Quarterly

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No instability was noted at the site during the visit.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 6906 ft^3
60% Elevation: 7860.8 feet ASL (above sea level)
100% Elevation: 7861.3 ASL
Current Sediment Level Elevation: The pond was cleaned of sediment this quarter, including the small delta that had developed at the east end of the pond. At the time of the inspection, there was only a small puddle of water present in the lowest portion of the pond.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillways Elevation: 7865.5 feet ASL (The outlet of Pond 003 serves as both the principal and emergency spillway).

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

This pond did not discharge in the third quarter of 2004, therefore no water samples were obtained. The pond had minimal water in it at the time of the inspection. Water occupied only the lowest-most portion of the pond. The vegetation on the out slopes of the pond embankment do not appear to present any type of hazardous conditions. No instability was noted in the pond embankment. Musk Thistle had started to grow on the embankment but was removed before flowering.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

Other than the removal of a minimal accumulation of sediment, no changes have been noted in the geometry of the pond since the last inspection. The pond has evidently held very little water. The pond appears to have at least 100% of its sediment storage capacity remaining. The estimated volume of water in the pond at the time of the inspection was less than 0.02 acre-feet.

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Chris D. Hansen **Date:** 9-28-04

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	December 29, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Mine Site Sediment Pond	
	Impoundment Number	001	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	December 29, 2004
Inspected By	Carl Winters
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Annual

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

No signs of instability were observed. No hazardous conditions were observed during the inspection of the pond.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 72,658 ft^3
60% Elevation: 8568.5 feet ASL (above sea level)
100% Elevation: 8571.5 feet ASL
The current elevation of the sediment within the pond at the discharge point was not measured during this inspection. The pond was partially frozen over. During the last quarterly inspection the sedimemt level was approximately 8,567.0 ft ASL (21,797 $ft^{3)}$. At this elevation, approximately 70% of the storage volume remains. The remaining sediment volume storage capacity is approximately 50,861 ft^3. This volume has apparently not changed since the last quarter.

3. Principle and emergency spillway elevations.

Principal and Emergency Spillway Elevations: 8579.6 feet ASL (The outlet structure for Pond 001 serves as both the Principal and Emergency Spillways)

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT		

4. **Field Information.** Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

The pond area is covered by several inches of snow. Water elevation at the time of inspection was 8579.7 feet ASL with a discharge of approximately 250gpm occurring. The sediment pond has not discharged continuously this quarter. A sample of the mine discharge water, including this pond's discharge, has been taken on weekly basis throughout the quarter as required by the mine's UPDES permit. On a biweekly basis the water sample is analyzed for total iron and total dissolved solids. Weekly samples include oil and grease, total suspended solids, pH and conductivity.

Surface water is collected from the upper mine pad and discharged to the pond through a culvert located on the west end of the pond. The culvert appeared to be functioning as designed. The outlet structure was working as designed and appeared to be in good working condition.

A small area on the north side of the pond has a colony of cattails. The colony poses no threat to the operation of the pond.

The pond was cleaned of most of its sediment in October 2003.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The overall geometry of the pond does not appear to have been modified this quarter. However, the pond was partially frozen over and the banks were covered with snow. Minor changes to the pond geometry could not be observed due to the snow cover. The pond has infrequently discharged this quarter. The minimum elevation has been approximately 8579.0. Water height over the lip of the discharge pipe can vary between 0.00 and 0.26 feet. Total storage volume for water and sediment combined is 179,014 ft^3 (4.1 ac-ft).

Based on the estimated volume of sediment, the estimated volume of water in the pond is 157,217 ft^3 (3.61 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Carl W. Walter **Date:** 30 Dec 2004

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	Yes	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	Yes	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	Yes	

COMMENTS AND OTHER INFORMATION

Exceedances of the tons/per day permit limit have occurred in this and the previous quarter of this year. However, since the water quality was acceptable with regard to all other parameters and a verbal agreement to participate in a downstream salinity reduction program has been made with Utah Division of Water Quality (as allowed in the mine's UPDES Permit), no enforcement action is warranted.

Certification Statement:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO. 22 157958-2202
12-30-04
STATE OF UTAH
[PE Cert. Stamp]

By: Carl W. Winters
Operations Support Mgr-Skyline Mine
(Full Name and Title)

Signature: Date: 30 Dec 2004

P.E. Number & State:
22 157958-2202 Utah

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	December 29, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Rail Loadout Sediment Pond	
	Impoundment Number	002	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	December 29, 2004
Inspected By	Carl Winters
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Annual

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

The site was snow covered at the time of the inspection.
No instability of the embankment was noted during the inspection. No hazardous conditions were noted at the time of the inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity: 54,710 ft^3
60% Elevation: 7915.0 feet ASL (above sea level)
100% Elevation: 7915.6 ASL
Current Sediment Level Elevation: 7914.8 feet ASL. The sediment pond was cleaned of sediment in the last week of October 2003.

3. Principle and emergency spillway elevations.

Principle Spillway Elevation: 7919.7 feet ASL
Emergency Spillway Elevation: 7922 feet ASL

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Current water surface elevation was 7,919.4 feet ASL, 0.3 feet below the spill point of the principal spillway. The pond surface is currently covered by several inches of ice.

The pond was not discharging at the time of the inspection and has not discharged this quarter. The pond has not been decanted since October 2003. The pond embankment appears stable and without noticeable erosion. Vegetation growing on the embankment and outslopes does not appear to create hazardous conditions. However, there were several inches of snow covering the site at the time of the inspection and minor changes to the pond geometry could have occurred but not observed.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The geometry of the pond does not appear to have changed recently. The sediment volume in the pond during the 3rd quarter inspection was estimated to be 25,531 ft^3 with a remaining sediment storage capacity of 29,179 ft^3. The water level at the time of the inspection was 7,919.4 ft ASL. The maximum elevation during the year, which occurred in early spring when the pond did discharge, was approximately 7919.8.

Total storage capacity of water and sediment combined is 95,380 ft^3 (2.2 ac-ft). Assuming the sediment volume is approximately 29,179 ft^3, the estimated total water capacity remaining in the pond is approximately 66,201 ft^3 (1.52 ac-ft).

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature** Carl W. Winter **Date:** 30 Dec 2004

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	Yes	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	Yes	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	Yes	

COMMENTS AND OTHER INFORMATION

Certification Statement:

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
12-30
STATE OF UTAH

[PE Cert. Stamp]

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Carl W. Winters
Operations Support Mgr - Skyline Mine
(Full Name and Title)

Signature: Carl W. Winters **Date:** 30 Dec 2004

P.E. Number & State:
22 157958-2202 Utah

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			
Permit Number	C/007/005	Report Date	December 29, 2004
Mine Name	Skyline Mines		
Company Name	Canyon Fuel Company		
Impoundment Identification	Impoundment Name	Waste Rock Site Sediment Pond	
	Impoundment Number	003	
	UPDES Permit Number	UT0023540	
	MSHA ID Number	NA	

IMPOUNDMENT INSPECTION

Inspection Date	December 29, 2004, Site inaccessible due to the depth of snow cover.
Inspected By	Chris Hansen
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	Annual

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

The site was inaccessible at the time of this annual inspection.

No instability was noted at the site during the previous quarterly gob site inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.	**2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.** Sediment Storage Capacity: 6906 ft^3 60% Elevation: 7860.8 feet ASL (above sea level) 100% Elevation: 7861.3 ASL Current Sediment Level Elevation: The pond was cleaned of sediment in July of 2004, including the small delta that had developed at the east end of the pond. At the time of the 3rd quarter gob pile inspection, there was only a small puddle of water present in the lowest portion of the pond.
	3. Principle and emergency spillway elevations. Principal and Emergency Spillways Elevation: 7865.5 feet ASL (The outlet of Pond 003 serves as both the principal and emergency spillway).

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

This pond did not discharge in the fourth quarter of 2004, therefore no water samples were obtained.

5. Field Evaluation. Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

The site was inaccessible at the time of the inspection. Since no material has been placed at this site since the 3rd quarter Gob Inspection and no other surface work has occurred, it is unlikely any significant changes to the geometry of the pond have occurred in this quarter.

Qualification Statement	I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability. **Signature:** Carl W. Winston **Date:** 30 Dec 2004

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	Yes	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	Yes	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	Yes	

COMMENTS AND OTHER INFORMATION

The pond has not discharged in the previous three quarters of 2004. There have been no reports of discharge from the pond this quarter. The construction of the pond has not been modified in several years.

Certification Statement:

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
STATE OF UTAH

[PE Cert. Stamp]

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Carl W. Winters
Operations Support Mgr - Skyline Mine
(Full Name and Title)

Signature: Carl W. Winters **Date:** 30 Dec 2004

P.E. Number & State:
22 157958-2202 Utah

APPENDIX B

Reporting of Technical Data

Including monitoring data, reports, maps, and other information
As required under the approved plan or as required by the Division

In accordance with the requirement of R645-310-130 and R645-301-140

CONTENTS

2004 Subsidence Monitoring Map
2004 Vegetation Monitoring Information
Spring 2003 James Creek and Burnout Creek Macroinvertabrate Study
Fall 2003 Eccles Creek Macroinvertabrate Study

2004 Vegetation Report for Skyline Mine

The following seedlings were purchased from the Lone Peak Nursery in Draper Utah:

- Wood Rose,
- Saskatoon Service Berry, and
- Golden Current.

Snowberry seedlings were not available for the 2004 planting season. The seedlings were planted in early May 2004 along the conveyor bench just west of the former vegetative test plot. The plants were grown from seeds collected from plants in Utah and Colorado at elevations similar to the mine site. The 2003 seedlings appeared to fare better than the 2002 seedlings; approximately 30 to 40% appeared to have survived the year. The 2004 seedlings appear to have done even better with an early success ratio of 50 to 60% survival.

The following plants have been ordered for the spring of 2005: Cliff Rose, Rabbit Brush, and Utah Serviceberry. These plants, provided they will be available and the crop survives, will be planted in early May 2005 again in the former test plot area of the conveyor bench.

The Macrobenthos of James Canyon Creek & Burnout Creek, Tributaries to Electric Lake, Huntington Creek drainage

Spring 2003

Prepared by

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for

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Skyline Mines
HC 35 Box 380
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March 2005

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The Macrobenthos of
James Canyon Creek & Burnout Creek,
Tributaries to Electric Lake,
Huntington Creek drainage

Spring 2003

INTRODUCTION

Both James Canyon Creek and Burnout Creek of the Hunting Creek drainage basin, Carbon County, Utah, are in an area that is subject to subsidence due to coal mining activities. These two streams have been monitored since the fall of 2000 to document changes than may be associated with subsidence in their watersheds.

PURPOSE

This report covers the results from samples taken June 12, 2003 from James Canyon Creek and Burnout Creek. These are the sixth set of benthic invertebrate samples take from James Canyon Creek and the fifth set taken from Burnout Creek .

METHODS

Quantitative samples were taken with a modified box sampler (Shiozawa 1986) using a capture net with a net mesh of 253 microns. Three samples were taken at both James Canyon Creek and Burnout Creek, as prescribed to Canyon Fuels Corporation by the Utah Division of Wildlife Resources. The samples were preserved in the field with ethyl alcohol and were returned to the laboratory for processing. The samples were sorted in a backlit illuminated pan. Organisms were identified to the lowest taxonomic unit possible. Small specimens and those of questionable identity were examined under magnification. After the sample had been sorted with the unaided eye and visible invertebrates removed, the remaining material was subsampled and examined under magnification to insure the small organisms were included in the counts. Identification was based on the keys of Merritt and Cummins (1994). The mean values for each taxon were used to determine the density per square meter. Standing crop was estimated from wet weights of total invertebrates collected at the station.

The USFS Biotic Condition Index (Winget and Mangum 1979) was calculated with the community tolerance quotient (CTQa). The predicted community tolerance quotient (CTQp), based on water chemistry data provided in Winget (1972) for the Huntington Creek drainage, was 80. Diversity was calculated using the Shannon-Weiner index (Pielou 1977). Cluster analysis was run with NTSYS-pc, using the Bray-Curtis dissimilarity index with the UPGMA clustering algorithm. Data from both Burnout Creek and James Canyon Creek for all sampling periods (fall 2000 through spring 2003) were included in the cluster analysis.

RESULTS

Twenty three taxonomic categories (including larvae and adults and unidentifiable immature insects as separate taxa) were identified in the spring 2003 samples from both Burnout Creek (Table 1; Appendix 1) and James Canyon Creek (Table 2, Appendix 2). The same number were collected in the fall 2002 samples from James Canyon Creek, but more were collected in the spring of 2001 and 2002. Burnout Creek had a total density of 25,178 organisms per square meter, while James Canyon Creek had a density of 51,488 organisms per square meter. The bulk of the organisms in Burnout Creek were chironomid larvae (52%) and ostracods (26%). The same two taxa dominated in James Canyon Creek, where chironomid larvae comprised 45% and ostracods comprised 21% of the organisms.

The estimated Burnout Creek density was about 34% lower than in the previous spring sampling effort (2002), but the number of organisms was still generally comparable to the mean number collected other sampling periods. The total number of organisms in James Canyon Creek was double that recorded in the spring of 2002, and almost 30% higher than recorded in the fall of 2002.

Table 1. Summary of densities for Burnout Creek 2000-2003.

Burnout Creek		Fall 2000	Spring 2001	Fall 2001	Spring 2002	Spring 2003
Ephemeroptera	*Baetis*	404	949	848	545	879
	Cinygmula	566	10	1051	636	525
	Drunella doddsi	0	0	10	0	0
	Drunella grandis	0	20	20	10	40
	Epeorus iron	0	0	0	71	10
	Ephemerella	182	20	101	71	0
	early instar Ephemerillidae	0	0	0	0	0
	Heptagenia	91	0	0	0	0
	Paraleptophlebia	1160	40	525	10	0
	Rhithrogena	10	0	0	10	0
Plecoptera	Early instar Plecoptera	51	20	0	10	0
	Diura knowltoni	20	0	0	0	0
	Isoperla	71	10	10	10	20
	Malenka californica	142	0	0	0	0
	Megarcys signata	0	0	10	0	0

	Paraperla	0	0	0	0	0
	Skwalla parallela	0	10	0	10	0
	Sweltsa	51	0	20	0	0
	Zapada	10	10	0	0	0
Trichoptera	*Allomyia*	0	0	0	0	0
	Amiocentrus	0	0	10	0	0
	Arctopsyche grandis	0	0	0	0	0
	Brachycentrus echo	0	10	30	10	10
	Dicosmoecus	0	10	131	0	0
	Ecclisocosmoecus	20	0	0	0	0
	Hydropsyche	0	0	0	0	10
	Lepidostoma	0	0	0	30	0
	Limnephilus	0	0	0	0	10
	Micrasema	0	131	142	242	0
	Moselyana	20	0	0	0	0
	Neothremma alicia	252	81	101	51	152
	Oligophlebodes	40	202	515	30	0
	Platycentropus	0	0	10	0	0
	Rhyacophila (larvae)	121	101	121	202	576
	pupae	0	0	0	0	10
Coleoptera	*Heterlimnius* (larvae)	354	2827	2505	455	10
	Heterlimnius (adult)	40	51	152	71	0
	Optioservus (larvae)	71	0	0	1263	1111
	Optioservus (adult)	0	0	0	162	40
	Staphylinidae	0	0	0	0	0
Diptera	*Atrichopogon*	0	0	0	0	0
	Antocha (larvae)	40	152	0	51	0
	Antocha (pupae)	0	20	0	0	0
	Atherix	0	0	0	0	0
	Caloparyphus	0	0	0	0	0
	Ceratopogonidae	0	20	20	0	30

	Chelifera	0	121	0	0	10
	Chironomidae (larvae)	3919	21928	2636	29684	13080
	Chironomidae (pupae)	0	485	0	10	51
	Dicranota	20	10	10	10	0
	Dixa	0	0	0	0	0
	Euparyphus	20	0	10	10	0
	Hemerodromia	0	0	0	0	0
	Limnophila	0	0	0	0	0
	Pericoma	111	0	0	0	0
	Phoridae	0	0	0	10	0
	Ptychoptera	81	0	0	0	0
	Simulium (larvae)	121	30	323	0	212
	Simulium (pupae)	0	30	0	81	0
	Tipula	10	30	40	10	40
	Trichoclinocera	0	0	0	10	0
	Wiedemannia	0	0	0	0	0
Crustacea	*Asellus*	10	0	0	0	0
	Cladocera	0	495	0	545	0
	Copeopoda	0	0	0	10	303
	Ostracoda	4202	5181	5656	1576	6454
Arachnida	Hydracarina	20	202	0	10	313
Mollusca	*Sphaerium*	40	363	252	364	929
Annelida	Hirudinea	0	0	0	0	0
	Oligochaeta	303	899	3596	636	343
Platyhelimenthes	Planariidae	0	626	1111	263	0
number of taxa		33	32	29	36	25
Totals		12595	35259	19998	38168	25178

Table 2. Summary of densities for James Canyon Creek, 2000-2003.

James Canyon summary		Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003
Ephemeroptera	*Baetis*	2848	1030	2444	404	6757	2823
	Cinygmula	313	348	404	485	0	697
	Drunella doddsi	0	0	30	0	0	0
	Drunella grandis	0	1030	0	1485	0	949
	Epeorus iron	0	0	0	10	283	0
	Ephemerella	980	20	10	91	2434	0
	early instar Ephemerillidae	30	0	495	0	0	1010
	Heptagenia	30	30	0	0	0	0
	Paraleptophlebia	40	0	81	20	91	0
	Rhithrogena	0	51	0	0	0	0
Plecoptera	Early instar Plecoptera	646	879	30	293	152	20
	Alloperla	0	0	0	0	0	10
	Diura knowltoni	0	0	0	0	0	0
	Isoperla	71	0	51	10	212	0
	Malenka californica	10	0	142	0	121	0
	Megarcys signata	0	0	10	0	0	0
	Paraperla	0	10	0	0	0	0
	Skwalla parallela	0	414	0	61	0	0
	Sweltsa	0	10	30	0	0	0
	Zapada	242	111	182	111	758	0
Trichoptera	*Allomyia*	131	0	0	0	0	0
	Amiocentrus	0	0	0	0	0	0
	Arctopsyche grandis	51	10	10	0	20	0
	Brachycentrus echo	171	0	0	0	0	0
	Dicosmoecus	10	0	0	30	10	0
	Ecclisocosmoecus	0	0	0	0	0	0
	Hydropsyche	0	0	0	0	0	0
	Lepidostoma	0	30	103	0	172	0

	Micrasema	81	0	30	0	0	0
	Moselyana	0	0	0	0	0	0
	Neothremma alicia	3000	1384	758	727	2475	1848
	Oligophlebodes	0	364	153	20	0	0
	Platycentropus	0	0	0	0	0	0
	Psychomyia	0	0	0	0	0	0
	Rhyacophila (larvae)	394	798	293	576	556	1040
	Rhyacophila (pupae)	0	30	0	20	0	0
Coleoptera	*Heterlimnius* (larvae)	30	192	51	0	0	0
	Heterlimnius (adult)	0	20	0	40	0	0
	Optioservus (larvae)	10	0	0	293	283	383
	Optioservus (adult)	0	0	0	0	51	0
	Staphylinidae	0	10	10	0	0	505
Diptera	*Antocha* (larvae)	10	0	0	10	51	0
	Antocha (pupae)	0	0	0	0	0	0
	Atherix	10	0	0	0	0	0
	Atrichopogon	0	0	0	0	0	10
	Caloparyphus	0	51	20	0	0	0
	Ceratopogonidae	40	61	0	10	0	586
	Chelifera	51	81	0	40	0	91
	Chironomidae (larvae)	23533	20614	4464	21974	19917	23351
	Chironomidae (pupae)	20	455	10	323	20	212
	Dicranota	20	0	0	0	0	0
	Dixa	0	10	0	0	0	81
	Euparyphus	10	0	0	0	71	0
	Hemerodromia	0	0	0	10	0	0
	Limnophila	0	20	0	0	0	0
	Pericoma	30	0	0	0	0	1091
	Phoridae	91	0	10	0	0	0
	Ptychoptera	0	0	10	0	0	0
	Simulium (larvae)	91	10	111	0	939	40

	Simulium (pupae)	0	0	0	0	0	0
	Tipula	0	10	0	0	61	81
	Trichoclinocera	0	10	0	0	0	0
	Wiedemannia	81	0	20	0	0	0
Crustacea	*Asellus*	0	0	0	0	0	0
	Cladocera	0	51	0	343	0	848
	Copeopoda	10	0	0	0	0	596
	Ostracoda	1778	858	323	162	1202	10837
Arachnida	Hydracarina	10	101	20	81	20	1343
Mollusca	*Sphaerium*	20	353	71	141	0	3535
Annelida	Hirudinea	0	0	0	0	10	0
	Oligochaeta	202	192	40	394	72	20
Platyhelimenthes	Planariidae	0	828	1343	1020	3414	0
		36	36	37	29	26	26
Totals		34757	30805	11716	28886	40158	51488

Biomass

Burnout creek biomass, wet weight, was 33.9 grams per square meter (Table 3), which is up from the spring of 2002 when the estimate was 25.1 grams per square meter, and is similar to that of the spring of 2001 (32.12 grams per square meter). James Canyon Creek biomass (wet weight) in the spring of 2003 sampling series was 72.7 grams (Table 3). This is up from the previous spring when James Canyon Creek had a wet weight of 36.87 grams per square meter and much higher than the biomass estimates of fall 2001, of 23.6 grams pre square meter. The increased biomass in James Canyon may be indicative of recovery from the perturbations in 2001, but an additional factor may be the lack of access to the stream by fish, which developed with the decline in the reservoir level.

Table 3. Mean biomass per meter square, Spring 2003

Stream	Sample1	Sample2	Sample3	Mean	standing crop /m^2
Burnout	1.26g	1.29g	0.82g	1.12g	33.9g
James Canyon Creek	1.70g	3.21g	2.28g	2.40g	72.7g

Biotic Condition Index

The community tolerant quotient (CTQa) was generated using the ratings for individual invertebrate taxa (Table 4) provided by Winget and Mangum (1979). James Canyon Creek had a CTQa of 80.1 while Burnout Creek had a CTQa of 76. While these values are similar, the taxa composition in the two streams were not identical. James Canyon Creek, in the spring of 2002, had a CTQa rating of 66, while for the fall of 2002 it had a CTQa rating of 59 (Table 5). Lower values represent higher habitat quality under this measure so it indicates that James Canyon Creek had declined in habitat quality in the spring 2003 sample series. Burnout Creek has a CTQa of 60.8 in the spring of 2001, and 64.1 in the spring of 2002. It, as with James Canyon Creek, indicates a decline in habitat quality.

Table 4. Tolerance Quotients for taxa collected in James Canyon and Burnout Creek (after Winget and Mangum 1979).

			James Canyon	Burnout Creek
Ephemeroptera	*Baetis*	72	72	72
	Cinygmula	21	21	21
	Drunella doddsi	24		
	Drunella grandis	24	24	24
	Epeorus iron	21		21
	Ephemerella	48		
	early instar *Ephemerella*	48	48	
	Heptagenia	48		
	Paraleptophlebia	24		
	Rhithrogena	21		
Plecoptera	Early instar Plecoptera	48		
	Alloperla	24	24	
	Diura knowltoni	24		
	Isoperla	48		48
	Malenka californica	36		
	Megarcys signata	24		
	Paraperla	48		
	Skwalla parallela	18		
	Sweltsa	24		

	Zapada	16		
Trichoptera	*Allomyia*	108		
	Amiocentrus	24		
	Arctopsyche grandis	18		
	Brachycentrus echo	24		24
	Dicosmoecus	24		
	Ecclisocosmoecus	108		
	Hydropsyche	108		108
	Lepidostoma	18		
	Limnephilus	108		108
	Micrasema	24		
	Moselyana	108		
	Neothremma alicia	8	8	8
	Oligophlebodes	24		
	Platycentropus	108		
	Rhyacophila (larvae)	18	18	18
	Rhyacophila (pupae)	18		
Coleoptera	*Agabus*	72		72
	Heterlimnius (larvae)	108		
	Heterlimnius (adult)	108		
	Optioservus (larvae)	108	108	108
	Optioservus (adult)	108		108*
	Staphylinidae	108	108	
Diptera	*Antocha* (larvae)	24		
	Antocha (pupae)	24		
	Atherix	24		
	Caloparyphus	108		
	Ceratopogonidae	108	108	108
	Chelifera	108	108	108
	Chironomidae (larvae)	108	108	108
	Chironomidae (pupae)	108	108*	108*

	Dicranota	24		
	Dixa	108	108	
	Euparyphus	108		
	Hemerodromia	108		
	Limnophila	108		
	Pericoma	108	108	
	Phoridae	108		
	Ptychoptera	108		
	Simulium (larvae)	108	108	108
	Simulium (pupae)	108		
	Tipula	36	36	36
	Trichoclinocera	108		
	Wiedemannia	108		
Crustacea	*Asellus*	108		
	Cladocera	108	108	108
	Copeopoda	108	108	108
	Ostracoda	108	108	108
Arachnida	Hydracarina	108	108	108
Mollusca	*Sphaerium*	108	108	108
Annelida	Hirudinea	108		
	Oligochaeta	108	108	108
Platyhelimenthes	Planariidae	108		
	sum of TQ		1763	1748
	n		22 (23)	23 (25)
	CVQa		80.14 (76.6)	76.00 (69.9)

* data not used in calculating the CTQ values. Values in () include the * data.

Table 5. Summary of CTQa values for the two Electric Lake tributaries.

CTQa	fall 2000	spring 2001	fall 2001	spring 2002	fall 2002	spring 2003
Burnout Creek	58.3	60.8	60.0	64.1	--	76.0
James Canyon Creek	65.6	72.0	68.7	66.1	59.0	80.1

Generally CTQa values less than 65 represent high quality waters, while those between 65 and 80 represent situations with moderate to high quality water (Winget and Mangum 1979). CTQa values greater than 80 represent low water quality or stressed systems. Thus these two streams have moderate to hig quality water, based on this measure. The BCI allows a comparison of a stream to a physical parameter based estimate of water quality, the CTQp. Since the Huntington drainage has a CTQp rated at a 80, the BCI = 100 X CTQp/CTQa = 100 X 80/CTQa. The BCI value for James Canyon Creek for the spring of 2003 was 105.5 and for Burnout Creek it was 99.9 (Table 6). Both of these values are very close to the predicted condition for these streams. However the previous BCI values indicated that the streams have actually regressed in the spring of 2003.

Table 6. Summary of BCI values for the two Electric Lake tributaries.

BCI	fall 2000	spring 2001	fall 2001	spring 2002	fall 2002	spring 2003
Burnout Creek	137.2	131.6	133.3	124.8	--	105.3
James Canyon Creek	121.9	111.1	116.4	133.1	135.9	99.9

Diversity Indices

Diversity indices combine both number of taxa and relative densities into a single metric. High diversity index values indicate more taxa and a more even distribution of the number of individuals per taxon. Low diversity values generally reflect a depauperate fauna in both species and somewhat in numbers, although high densities of a few taxa will lower diversity scores. Both streams show moderate diversity levels, and are improved over the previous spring sampling period (Table 7). James Canyon Creek has diversity levels that are reasonably good (see reference levels for Eccles Creek in Shiozawa 2002) although not nearly as high as one would expect for an unimpacted system. Part of this discrepancy may be an artifact associated with the relatively small sample size of three replicates prescribed for these two locations.

Table 7 Summary of diversity values for the two Electric Lake tributaries.

CTQa	fall 2000	spring 2001	fall 2001	spring 2002	fall 2002	spring 2003
Burnout Creek	2.0346	1.43706	2.20136	1.08608	--	1.47518
James Canyon Creek	1.2630	1.56856	2.05724	1.20126	1.76384	2.38896

Cluster Analysis

Cluster analysis (Figure 1) of the total data set for James Canyon Creek and Burnout Creek (2000 - spring of 2003) generated, at a dissimilarity level of approximately 0.70, three clusters among the two streams. The lower two clusters include fall 2000 and 2001 samples from both James Canyon and Burnout creeks. The third and largest cluster does not split into subunits until a dissimilarity level of approximately 0.56. Two of the James Canyon samples from the spring of 2003 are in the upper subcluster (JC2S2003, JC3S2003), but the remaining samples are scattered throughout the lower subcluster. This suggests that the between sample variation is relatively high, being expressed at a dissimilarity level of as much as 0.50 (50% dissimilar) between samples. Such variation, while not unexpected in sampling, indicates that the best general trends may come from clustering of the mean densities for each station on each date. For that reason a second cluster analysis was completed utilizing the mean densities at each station.

The second cluster analysis (Figure 2) shows that the spring 2003 samples from both James Canyon (JCS2003) and Burnout (BS2003) creeks are becoming increasingly dissimilar to what they were in previous sampling periods. This change may be related to the continuing drought, but other factors could also be involved. The low number of samples taken per site will inherently increase the variance. Means of three samples will still be influenced by the between sample variation (theoretically the sample size needs to be about ten times more intense to maximize the benefits of the central limit theorem). Further, with the small sizes of the streams, it may be that repeated sampling at the sampling sites, which were explicitly located by the study requirements, has modified the substratum. This modification includes the break up of the carbonate marl which typifies some of the stream bed. Such changes would foster different densities of component taxa, allow the establishment of different species, or may foster the loss of some taxa. A general examination of the summary data for the two streams (Table 1, Table 2) does not support any significant switches in taxa. However Burnout Creek has fewer taxa than in 2000 and James Canyon Creek has lost a third of the taxa relative to what was collected in the first sampling period. Further interpretation and hopefully clarification of these results will be possible when the fall 2003 samples are included in the analysis.

CONCLUSIONS

Burnout Creek densities were down from those recorded in previous spring samples but James Canyon Creek densities had increased. Chironomids and ostracods were the dominant taxa in both streams, but the collector-gatherer, *Baetis*, was at high densities in both streams. In James Canyon Creek the predator, *Rhyacophila* was about double its long term average. One factor that may be

involved in this increased density of invertebrates is the change in density of fish. We were not asked to conduct a population estimate for the trout in the stream during 2002 or 2003, but in 2001 the trout density was down significantly and the low lake levels that have existed since the spring of 2002 have discouraged, if not prevented, spawning access to James Canyon Creek. A significant reduction in juvenile fish could result in changes in the benthic community since reduced fish predation pressure should allow invertebrate prey to increase.

Figure 1. Cluster dendrogram of the samples taken from Burnout and James Canyon Creeks 2000-2003.

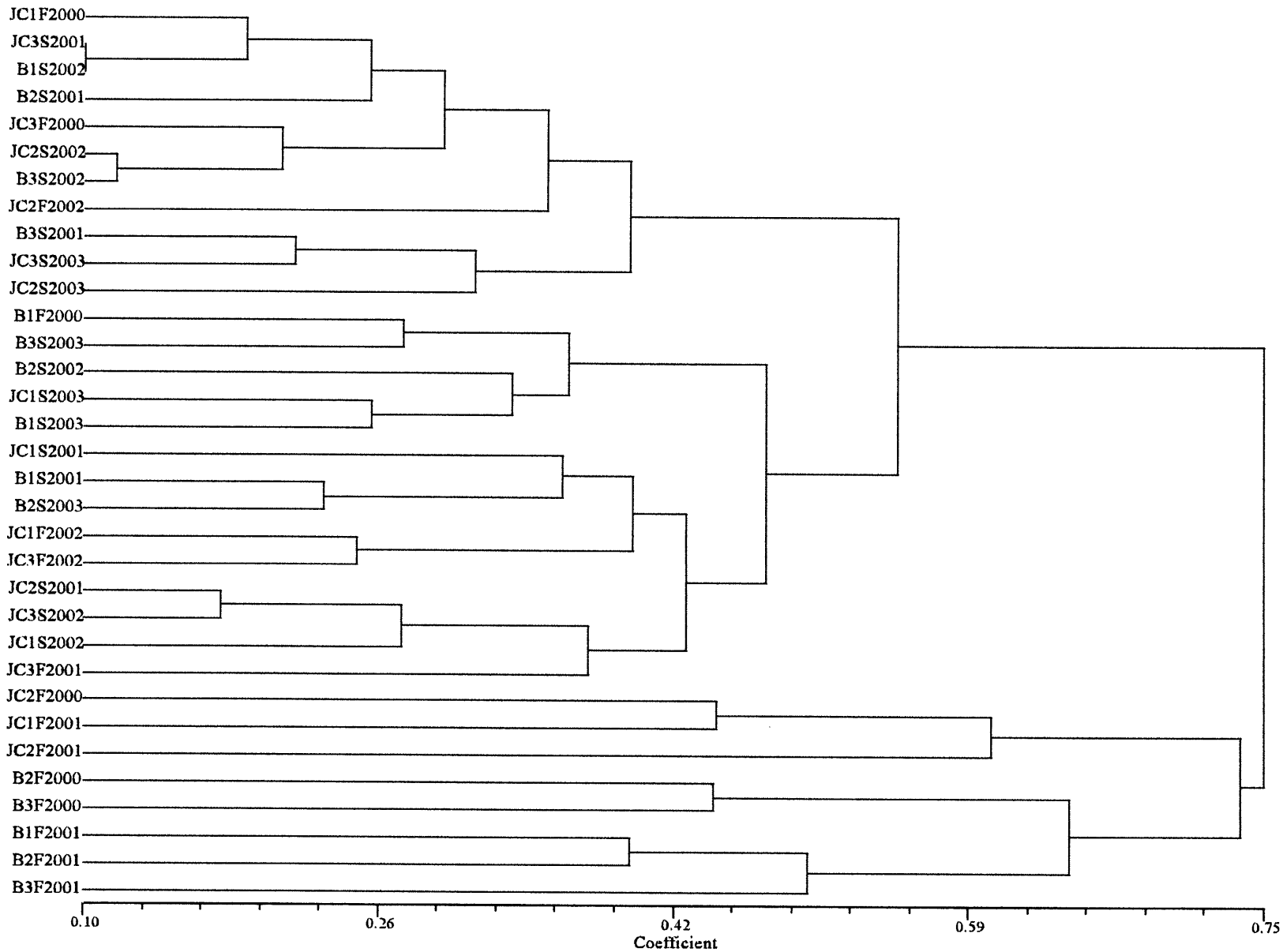
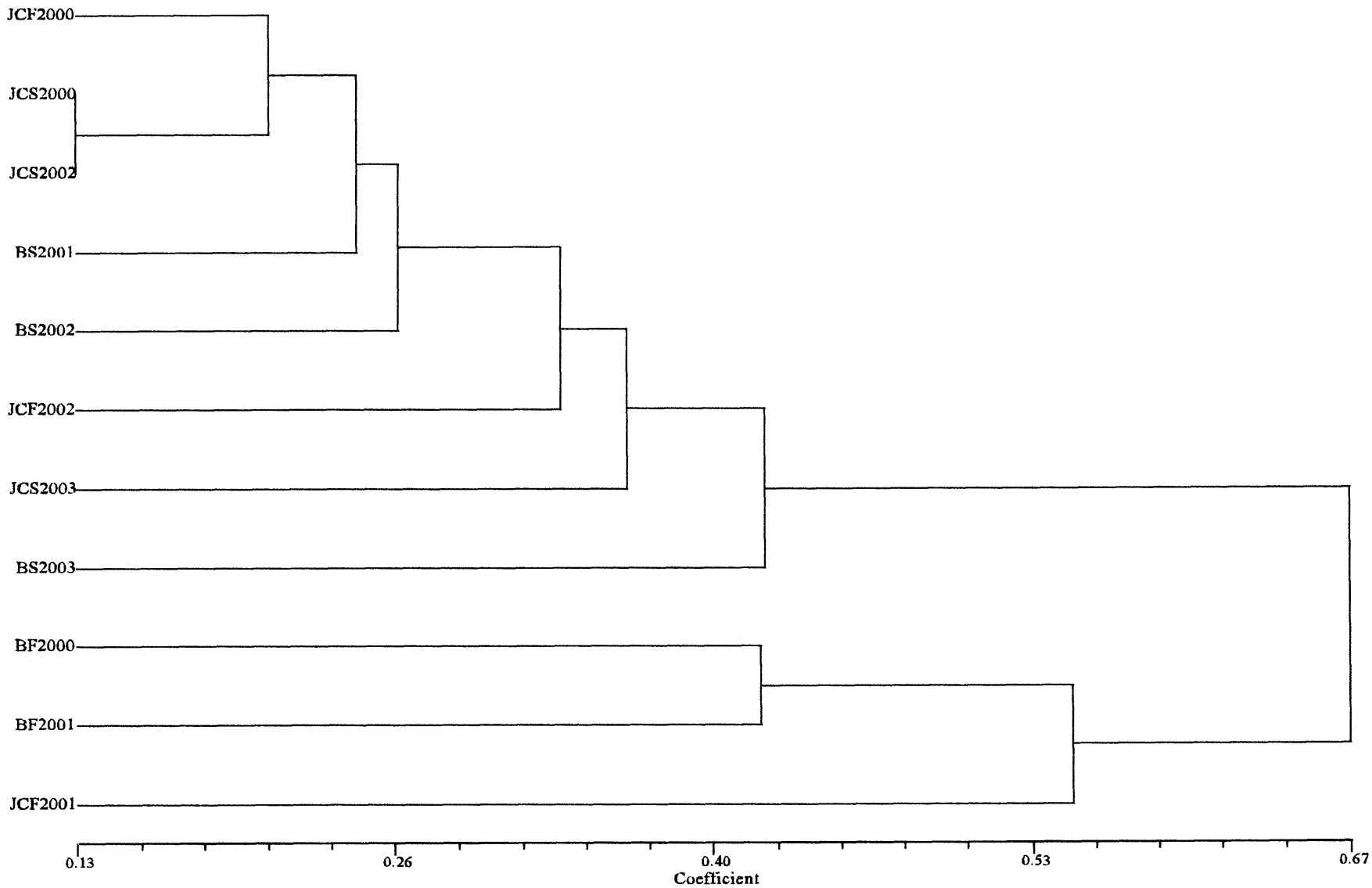


Figure 2. Cluster dendrogram based on the means of samples from each station from 2000 to 2003



Baetis, for instance, is a primary prey item for stream dwelling trout. The biomass in Burnout Creek was only slightly higher than in previous years, but James Canyon had about a two fold increases in biomass, which again may be reflecting the absence of trout predation.

Both streams had higher CTQa values than in previous sample periods, reflecting a decline in habitat quality. This was also reflected in the BCI values. While the indices indicate that the streams have moderate to high water quality, the CTQa is clearly higher than in all previous sampling periods. This could be related to the extended drought or may be reflecting local habitat degradation from repeatedly sampling the same locations, or a sampling error associated with the low numbers of samples taken per stream. Trophic cascades, which are likely drought influenced, may be complicating the data in James Canyon Creek as well.

Diversity indices indicate that James Canyon has improved while Burnout Creek is intermediate, lower than it has been during fall sampling, but comparable to the spring of 2001, and improved over the spring of 2002. However the robustness of these estimates are subject to the same concerns noted above for the CTQa estimation. The diversity data give a picture that is opposite of that given by the BCI indices.

Cluster analysis of individual samples indicates that the spring 2003 samples in both James Canyon and Burnout creeks have no easily discerned associations with one another. A second clustering based on mean densities in each stream for each date show both Burnout and James Canyon creeks in the spring of 2003 falling with a predominantly a spring - summer cluster. But they are the most dissimilar members of that cluster. This reflects the differences also detected in the diversity indices and the CTQa values. The interpretation of what these contrasting results are telling us about the two streams not straight forward since the drought and the lower levels of Electric Lake are confounding the interpretation of the data. Analyses of additional sample periods may help clarify the associations.

LITERATURE CITED

Elliott, J, M. 1977. Some methods for the statistical analysis of samples of benthic invertebrates. Freshwater Biological Association Scientific Publication No. 25. Ambleside.

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

Resh, V. H. and E. P. McElravy. 1993. Contemporary quantitative approaches to biomonitoring using benthic macroinvertebrates. In D. M. Rosenberg and V. H. Resh (eds). Freshwater biomonitoring and benthic macroinvertebrates. Chapman and Hall. NY, NY. pp.159-194.

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

Shiozawa, D. K. 2002. A compilation and comparison of the Eccles Creek macro-invertebrate data for the period of 1979-2002. Report to Canyon Fuel Co, LLC. Skyline Mines. September 2002.

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

Winget, R. N. and F. A. Mangum. 1979. Biotic condition index: integrated biological, physical, and chemical stream parameters for management. U. S. Forest Service Intermountain Region. Ogden, UT.

APPENDIX 1

Appendix 1. Spring 2003 statistics for the three samples from Burnout Creek

		1	2	3	mean	#/m^2
Ephemeroptera	*Baetis*	38	5	44	29	879
	Cinygmula	10	7	35	17.3	525
	Drunella grandis	1	0	3	1.3	40
	Epeorus iron	0	1	0	0.3	10
	Ephemerella	0	0	0	0	0
	Paraleptophlebia	0	0	0	0	0
	Rhithrogena	0	0	0	0	0
Plecoptera	Early instar Plecoptera	0	0	0	0	0
	Isoperla	0	0	2	0.7	20
	Malenka	0	0	0	0	0
	Skwalla parallela	0	0	0	0	0
	Zapada	0	0	0	0	0
Trichoptera	*Arctopsyche*	0	0	0	0	0
	Brachycentrus echo	0	1	0	0.3	10
	Dicosmoecus	0	0	0	0	0
	Hydropsyche	1	0	0	0.3	10
	Limnephilus	0	0	1	0.3	10
	Micrasema	0	0	0	0	0
	Neothremma alicia	3	5	7	5	152
	Psychomyia	0	0	0	0	0
	Rhyacophila (larvae)	48	6	3	19	576
	pupae	0	1	0	0.3	10
Coleoptera	*Heterlimnius* (larvae)	0	1	0	0.3	10
	Heterlimnius (adult)	0	0	0	0	0
	Optioservus (larvae)	48	18	44	36.7	1111
	Optioservus (adult)	2	0	2	1.3	40
	Agabus	0	0	1	0.3	10
Diptera	*Antocha* (Tipulidae)					
	Ceratopogonidae	2	0	1	1	30

	Chelifera	0	0	1	0.3	10
	Chironomidae (larvae)	353	609	333	431.7	13080
	Chironomidae (pupae)	4	0	1	1.7	51
	Dicranota	0	0	0	0	0
	Euparyphus	0	0	0	0	0
	Hemerodromia	0	0	0	0	0
	Pericoma (Psychodidae)	0	0	0	0	0
	Simulium (larvae)	17	4	0	7	212
	Simulium (pupae)	0	0	0	0	0
	Tipula	1	2	1	1.3	40
Crustacea	Cladocera	0	0	0	0	0
	Copeopoda	30	0	0	10	303
	Ostracoda	185	90	364	213	6454
Arachnida	Hydracarina	31	0	0	10.3	313
Mollusca	*Sphaerium*	1	1	90	30.7	929
Annelida	Hirudinea	0	0	0	0	0
	Oligochaeta	2	31	1	11.3	342
Platyhelimenthes	Planariidae	0	0	0	0	0
						25178
	No. of Taxa	16	14	16		23

APPENDIX 2

Appendix 2. Spring 2003 statistics for the three samples from James Canyon Creek

		1	2	3	mean	#/m^2
Ephemeroptera	*Baetis*	10	176	40	75.3	2283
	Cinygmula	29	2	38	23	697
	Drunella grandis	7	64	23	31.3	949
	Early instar Ephemerelids	0	100	0	33.3	1010
Plecoptera	Early instar Plecoptera	0	0	2	.7	20
	Alloperla	0	0	1	.3	10
	Malenka	0	0	0	0	0
	Skwalla parallela	0	0	0	0	0
	Zapada	0	0	0	0	0
Trichoptera	*Allomyia*	0	0	0	0	0
	Amiocentrus	0	0	0	0	0
	Arctopsyche	0	0	0	0	0
	Brachycentrus echo	0	0	0	0	0
	Dicosmoecus	0	0	0	0	0
	Ecclisocosmoecus	0	0	0	0	0
	Hydropsyche	0	0	0	0	0
	Lepidostoma	0	0	0	0	0
	Micrasema	0	0	0	0	0
	Moselyana	0	0	0	0	0
	Neothremma alicia	42	48	93	61.0	1848
	Oligophlebodes	0	0	0	0	0
	Psychomyia	0	0	0	0	0
	Rhyacophila (larvae)	7	81	15	34.3	1040
	Rhyacophila (pupae)	0	0	0	0	0
Coleoptera	*Heterlimnius* (larvae)	0	0	0	0	0
	Heterlimnius (adult)	0	0	0	0	0
	Optioservus (larvae)	4	4	30	12.7	384
	Optioservus (adult)	0	0	0	0	0
	Staphylinidae	0	50	0	16.7	505
Diptera	*Atrichopogon*	1	0	0	.3	10

	Antocha (pupae)	0	0	0	0	0
	Atherix	0	0	0	0	0
	Caloparyphus	0	0	0	0	0
	Ceratopogonidae	2	55	1	19.3	585
	Chelifera	3	3	3	3	91
	Chironomidae (larvae)	424	997	891	770.7	23351
	Chironomidae (pupae)	7	7	7	7	212
	Dicranota	0	0	0	0	0
	Dixa	5	3	0	2.7	81
	Euparyphus	0	0	0	0	0
	Hemerodromia	0	0	0	0	0
	Limnophila	0	0	0	0	0
	Pericoma (Psychodidae)	4	104	0	36	1091
	Phoridae	0	0	0	0	0
	Ptychoptera	0	0	0	0	0
	Simulium (larvae)	0	4	0	1.3	40
	Simulium (pupae)	0	0	0	0	0
	Tipula	2	4	2	2.7	81
	Trichoclinocera	0	0	0	0	0
	Wiedemannia	0	0	0	0	0
Crustacea	*Asellus*	0	0	0	0	0
	Cladocera	0	54	30	28	848
	Copeopoda	1	56	2	19.7	596
	Ostracoda	164	303	606	357.7	10837
Arachnida	Hydracarina	30	102	1	44.3	1343
Mollusca	*Sphaerium*	69	157	124	116.7	3535
Annelida	Hirudinea	0	0	0	0	0
	Oligochaeta	1	1	0	0.7	20
Platyhelimenthes	Planariidae	0	0	0	0	0
						51488
	No. of taxa	18	21	16		23

Eccles Creek Benthic Invertebrate Monitoring

October 2003

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ECCLES CREEK BENTHIC INVERTEBRATE MONITORING

October 2003

INTRODUCTION

In August of 2001 an aquifer tapped by Skyline Mine, near Scofield, Utah, significantly increased the discharge of water from the mine into Eccles Creek. The discharge maintained the stream at approximately bank full levels. This report summarizes results of monitoring of the benthic invertebrate community in Eccles Creek for fall, 2003 and includes summaries of previous data for comparative purposes. The samples taken in the fall of 2003 represents the fifth series taken from the stream following increased discharge. This project was undertaken for Canyon Fuel Company with the objective of determining the impact of the increased flows on the stream community.

METHODS

Quantitative samples were taken from Eccles Creek on October, 2003. The three stations sampled were Eccles Creek above South Fork (EC-2: N 39^0 40.970', W 111.11.579', 8406 feet elevation), Eccles Creek at Whisky Canyon (EC-4: N 39^0 40.908', W 111.10.747', 8234 feet elevation), and Lower Eccles Creek (EC-5: N 39^0 41.001', W 111.10.031', 8074 feet elevation). These three stations have been sampled intermittently since 1979 (Shiozawa 2003). The same locations have been sampled since 2001. Five replicate samples were taken per station in rubble or cobble substrates to reduce sample variability. A box sampler with a net mesh of 250 microns was used to collect the samples. The substrate was stirred to a depth of approximately 5 cm. All rocks within the area of the sampler were removed and individually washed to insure quantitative collection of the invertebrates. The samples were concentrated on a screen with a mesh of 64 microns and field preserved in ethyl alcohol. A GPS unit was used to both locate and record the positions of the sample stations.

In the laboratory the samples were sorted in illuminated pans. All invertebrates were removed and identified to the lowest possible taxonomic level using the keys of Merritt and Cummins (1996). Sub-samples were taken from the samples after they were visually sorted. The remaining material was placed in a beaker and the volume adjusted to 200 ml. Five 2 ml subsamples then were processed under magnification with a dissecting scope. The mean density per subsample was used to project the total density of organisms remaining in the visually sorted sample, and these projections were added to the total count from the visual sorting. The data were then used to determine the density of taxa per square meter. Mean biomass estimates were also generated so that trends in standing crop could be documented.

Analyses included comparisons of the number of taxa and mean densities in the October 2003 samples

with those generated from samples taken June 2003, October 2002, November 24, 2001 (Shiozawa 2002a) and July 2, 2002 (Shiozawa 2002c), and with samples taken in 1979 (Winget 1980) and1992 (Ecosystems Research Institute,1992). These comparisons allow a general evaluation of changes since the increased discharge of mine water into the stream channel relative to other perturbations and baseline conditions.

The community tolerance quotient (CTQa; Winget and Mangum 1979) was used to gain insight into the condition of the stream relative to idealized system predicted from slope, water chemistry, and substrate. Water chemistry for Eccles Creek was provided by EarthFax Engineering (2001). The following estimates for Eccles Creek were used for alkalinity and sulfate levels: alkalinity - 264 mg/l; sulfate - 49 mg/l. The gradient in Eccles Creek it is approximately 3.3%. With its combination of physical properties, it had a predicted community tolerance quotient (CTQp) of 80 (Winget and Mangum 1979). The Biotic Condition Index was used to further interpret the data generated with this procedure.

Diversity was calculated using the Shannon-Weiner index (Pielou 1977). This allows a general comparison among sample stations and dates. Diversity indices take the number of taxa and their individual densities into account, generating a single value for each station. The greater the number of species or taxa and the more even the distribution of densities among taxa, the higher the index value. Finally, the data were clustered with the UPGMA algorithm using the Bray-Curtis measure of dissimilarity (Poole 1974, Krebs 1989). The NTSYSpc package was utilized to generate the cluster dendrograms (Rolf 2000).

RESULTS AND DISCUSSION

Number of Taxa

Twenty one taxa, including the categories of chironomid pupae and unidentifiable plecopetrans, were collected from Eccles Creek in the fall 2003 samples. Excluding the above two categories, five taxa were collected in EC2 , 13 in EC5, and 11 in EC4 (Table 1). The total number of taxa is more than collected in the spring of 2003, but less than the 23 taxa collected in October 2002. The number of taxa is still significantly higher than the five taxa (*Baetis*, *Hydropsyche*, *Pedicia*, chironomids, and ostracods) gathered from Eccles Creek in the 2001 sampling series. In comparison to the October 2002 and June 2003 data, the October 2003 samples maintained or increased in the number of taxa at sites EC4 and EC5, but station EC2, the upstream most site sampled, significantly decreased in the number of taxa. These numbers are still comparable with data collected in the early 1990s (Ecosystems Research Institute,1992), but are a third to a fourth the number collected in the late 1970s (Winget 1980). If the stream is to recover to the premining

Table 1. Number of taxa collected from Eccles Creek.

	Winget 1980		Ecosystems Research Institute 1992			Shiozawa 2002a	Shiozawa 2002c	Shiozawa 2003	Shiozawa and Hansen 2004	This report
Sampling date	May-June 1979	Aug 1979	June 1990	Oct 1990	Sept 1991	Nov 2001	July 2002	Oct 2002	June 2003	Oct 2003
South Fork tributary above mine, upper site (USF2)			20	11						
South Fork tributary above mine (USF)			12	9	21					
Middle Fork tributary above mine (UMF)			14	18						
Eccles Creek below mine (EC1)			4	2						
Eccles Creek above south Fork (EC2)		42	6		6		6	11	11	5
South Fork Eccles Creek (SF)	36	35	12							
Eccles Creek below South Fork (EC3)	27	30								
Eccles Creek at Whisky Canyon (EC4)	35	37	7	17	15	6	14	7	9	13
Lower Eccles Creek (EC5)	38	21	12	13/11	14		6	11	9	11

condition, the number of taxa will need to increase substantially. However the sustained high discharge does not favor retention of detritus or fine and medium sized substrate particles, and thus it is unlikely that the stream can recover without a reduction in flow. The number of taxa in Eccles Creek between the observed impacts of the early 1990's and the increased discharge in 2001, is unknown. However, based on studies in the 1980s (see Shiozawa 2002b), it is reasonable to assume that just prior to the increased discharge of 2001, between 21 to 33 taxa were present per station. This suggests that a doubling to tripling of the number of taxa is a minimum recovery level.

Total Density Comparisons

The average density per square meter of invertebrates in the October 2003 series was 7730. This was slightly higher than the density in the June, 2003 sampling series (6670 per square meter) and is much higher than the October, 2002 densities when the average per square meter was 1877. However considerable variation existed between stations. The total density (Table 2) of invertebrates from station EC2 in October, 2003 was 1267 per square meter. This is about a fifth of the number collected in June 2003 at the same station, but is almost identical to the October 2002 density of 1260 per square meter. Eccles Creek at Whisky Canyon (EC4) densities were 5004 in the fall of 2003, about half of the density estimated in the June 2003 samples and over 3 fold higher than the previous fall series. The greatest change was in the Lower Eccles site (EC5) where the total densities were estimated at 16919 per square meter in October 2003, but were just 3387 in June of 2003 and 2879 in October of 2002.

The total density for October 2003 is also higher than previous samples taken by this lab (Shiozawa 2002c, 2003, Shiozawa and Hansen 2003) as well as the 1990 (Ecosystems Research Institute, 1992) estimates, but it is still lower than the value recorded in 1979. However station EC5 has reached total densities similar to those found during the baseline studies in the early 1980's. Based upon total densities alone, as a measure of recovery, the stream has still not recovered at stations EC2 and EC4 although EC5 appears to have met the higher density levels of the preconstruction data sets

Taxon Specific Densities

While total densities can give a quick picture of the state of the stream system, they can also be misleading if the individual taxa are not considered. High densities of relatively few taxa are common in stressed or polluted systems because under such conditions a few tolerant taxa are able to monopolize resources in an environment with reduced predation and competition.

In the October 2003 samples *Baetis* were absent in the uppermost station (EC2), but had good densities in EC4 (2448/m^2), and very high densities in EC5 (13,835/m^2) (Table 3). *Baetis* were absent or rare in the June 2003 sampling series. The October 2002 samples also showed *Baetis* absent at EC2, but this group was at 400/m^2 at EC4, and 1297/m^2 at EC5 (Table 4). The October 2003 trend thus is similar to the previous fall but the densities are higher. The absence of *Baetis* in the upper station, EC2, is of concern, and may be associated with the scouring that

Table 2. Total invertebrate densities per square meter for selected studies on Eccles Creek.

	Winget 1980		Ecosystems Research Institute 1992			Shiozawa 2002a	Shiozawa 2002c	Shiozawa 2003	Shiozawa & Hansen 2004	This report
Sampling date	May-June 1979	Aug 1979	June 1990	Oct 1990	Sept 1991	Nov 2001	July 2002	Oct 2002	June 2003	Oct 2003
South Fork tributary above mine, upper site (USF2)			1089	528						
South Fork tributary above mine (USF)			1144	216	2455					
Middle Fork tributary above mine (UMF)			1503	3812						
Eccles Creek below mine (EC1)			164	16						
Eccles Creek above south Fork (EC2)		73,181	267		89		3703	1260	6265	1267
South Fork Eccles Creek (SF)	9321	17773	1356							
Eccles Creek below South Fork (EC3)	18,093	23,247								
Eccles Creek at Whisky Canyon (EC4)	11,634	25,273	1719	3928	1419	61	8757	1491	10,351	5004
Lower Eccles Creek (EC5)	18661	2526	2212	4104/ 2863	1468		4927	2879	3387	16919

Table 3. October 2003 Sample data and invertebrates per square meter.

	Eccles Creek above South Fork (EC2)						Eccles Creek Whisky Canyon (EC4)						Lower Eccles Creek (EC5)					
Taxa	1	2	3	4	5	**#/m²**	1	2	3	4	5	**#/m²**	1	2	3	4	5	**#/m²**
Ephemeroptera: *Baetis*	0	0	0	0	0	**0**	166	114	74	38	12	**2448**	907	280	266	830	0	**13835**
Ephemeroptera: *Cinygmula*	0	0	0	0	0	**0**	30	0	0	0	1	**181**	0	0	0	0	0	**0**
Ephemeroptera: *Epeorus*	0	0	0	0	0	**0**	0	0	0	0	0	**0**	0	0	0	1	0	**6**
Plecoptera: early instar	0	0	0	0	0	**0**	0	0	0	0	0	**0**	0	0	1	0	0	**6**
Plecoptera: *Hesperoperla pacifica*	0	0	0	0	0	**0**	0	0	1	0	0	**6**	2	0	0	0	0	**12**
Plecoptera: *Skwalla parallela*	0	0	0	0	0	**0**	0	1	0	0	0	**6**	0	0	0	0	0	**0**
Trichoptera: *Brachycentrus*	0	0	0	0	0	**0**	1	0	0	0	0	**6**	0	0	0	0	0	**0**
Trichoptera: *Hydropsyche*	39	4	2	20	0	**394**	97	0	26	38	46	**1254**	9	0	8	23	0	**242**
Trichoptera: *Neothremma*	0	0	0	0	1	**6**	0	0	0	0	0	**0**	0	0	0	1	0	**6**
Trichoptera: *Ochrotricia*	0	0	0	0	0	**0**	0	0	0	0	0	**0**	0	0	0	1	0	**6**
Coleoptera: *Optioservus*	0	0	0	0	0	**0**	0	0	0	0	0	**0**	0	0	0	1	0	**6**
Diptera: Ceratopogonidae	0	0	0	0	0	**0**	0	0	0	0	1	**6**	0	0	0	0	0	**0**
Diptera: *Chelifera* (Empididae)	0	0	0	0	0	**0**	0	32	4	0	1	**224**	9	61	11	5	0	**521**
Diptera: Chironomidae larvae	7	7	0	4	61	**479**	7	35	32	31	1	**642**	33	4	70	63	1	**1036**
Diptera: Chironomidae pupae	0	0	0	0	0	**0**	1	30	0	0	0	**188**	4	0	7	0	0	**67**
Diptera: Tipulidae *Antocha*	0	0	0	0	0	**0**	0	0	0	0	0	**0**	5	0	1	10	0	**97**
Diptera: Tipulidae *Tipula*	0	0	0	0	0	**0**	0	0	2	0	0	**12**	0	0	0	0	0	**0**
Gyraulus	0	0	0	0	0	**0**	0	0	0	1	0	**6**	0	0	0	0	0	**0**
Sphaerium	0	0	0	0	0	**0**	0	1	0	0	0	**6**	0	0	0	0	0	**0**
Hydracarina	60	0	0	0	0	**364**	0	0	0	0	0	**0**	0	1	0	0	0	**6**
Oligochaeta	1	1	1	0	1	**24**	0	2	1	0	1	**24**	0	1	0	177	0	**1079**
totals	107	12	3	24	63	**1267**	302	215	140	108	62	**5004**	969	347	364	111	1	**16919**

has taken place in that reach. In August of 1979 *Baetis* were recorded at a density of over 47,000 per square meter at EC2.

The mayfly *Cinygmula* was in moderate densities in the middle site (EC4) with a density of 181/m^2, but rare or absent in the upper (EC2) and lower (EC5) sites. This genus was also absent in the fall 2002 samples, but was in very low densities at stations EC2 and EC4 in July of 2002. *Cinygmula* is a scraper-gatherer, feeding on algae and detritus on the surface of rocks. It is considered to be characteristic of relatively high quality systems, but its presence in the stream appears to be sporadic at best (Table 4), since in the July 2003 samples it was most abundant in the upper site (EC2). Prior to the construction of the road, this genus reached densities of over 8000 per square meter in late summer, although spring and early summer densities were around 1000 per square meter in the middle and upper reaches of Eccles Creek (Shiozawa 2002b). The fall numbers collected at EC4 are much less than should be expected under baseline conditions.

The hydroptilid caddisfly, *Ochrotricha*, was abundant in the EC4 June samples, but it was essentially absent in the samples taken in the fall of 2003. This group was not reported in the 1979 sampling series. The hydropsychid caddisfly *Hydropsyche* shows no clear trends. The numbers in the upper and lower sites have fallen, but the middle site appears to have remained relatively constant, even though this genus was not collected in the spring 2003 sample series at any of the sites. It appears that several more years of data are needed to interpret the dynamics of this group. The hydropsychids, like the Hydroptillidae, were not abundant in the 1979 samples.

Chironomids were the dominant taxon in the June 2003 samples, being present in densities of 3837, 7042, and 2424 per square meter at stations EC2, EC4, and EC5 respectively (Table 4). However in the October 2003 samples chironomids were the dominant taxon only in station EC2, with just 479 individuals per square meter. In both EC4 and EC5 their numbers, while higher than in EC2, were overshadowed by *Baetis*. In both EC2 and EC4 chironomid densities were about a tenth of what they were in June of 2003. This is associated with age structure in the community, since it is likely that the fall population consists of early instars. The same pattern was observed in 2002. The number of chironomids in the lower station, EC5, was slightly less than half of the density in June of 2003. The densities were a small fraction of what they were in the 1979 baseline data series.

Oligochaete densities fell at both EC2 and EC4, but increased at EC5. Their density at EC5 was the highest recorded from Eccles Creek since sampling was reinitiated in 2001. The October 2003 density was much lower than the 1979 values for EC2 and EC4, but the fall 2003 EC5 density was over 8 fold higher than the 1979 densities. Oligochaetes are deposit feeders, burrowing into sand and silt. They are indicative of depositional microhabitats, so in the case of this system, their abundance may be a function of the sand in the stream bed. This would indicate that more fine sediments are in the lower reaches of the stream. If so the continued flushing of the stream by the sustained discharge could be transporting fine sediments from the upper reaches of the stream.

Both the total densities of invertebrates in EC2 and EC4 in October 2003 and the numbers of individual taxa at each site suggest that the community has not yet recovered. The data suggest

Table 4. Summary data for the 2001-2003 data sets in Eccles Creek. Sample data and invertebrates per square meter.

	EC2				EC4				EC5			
Taxa	July 2002	Oct 2002	June 2003	Oct 2003	July 2002	Oct 2002	June 2003	Oct 2003	July 2002	Oct 2002	June 2003	Oct 2003
Ephemeroptera: *Baetis*	242	0	0	0	491	400	6	2448	200	1297	0	13835
Ephemeroptera: *Cinygmula*	6	0	230	0	6	0	6	181	0	0	0	0
Ephemeroptera: *Drunella*	0	0	0	0	0	0	0	0	0	6	0	0
Ephemeroptera: *Epeorus*	0	0	0	0	0	0	0	0	0	0	0	6
Plecoptera: early instar	0	0	0	0	12	0	0	0	12	0	0	6
Plecoptera: *Hesperoperla pacifica*	0	0	0	0	0	0	0	6	0	0	0	12
Plecoptera: *Isoperla*	0	0	0	0	0	0	0	0	0	18	0	0
Plecoptera: *Skwalla parallela*	0	0	0	0	0	0	0	6	0	0	0	0
Plecoptera: *Zapada*	0	0	12	0	0	0	0	0	0	0	0	0
Hemiptera: Saldidae	0	6	0	0	0	0	0	0	0	0	0	0
Trichoptera: pupae	12	0	0	0	0	0	6	0	0	0	0	0
Trichoptera: *Arctopsyche*	0	0	0	0	0	6	0	0	0	0	0	0
Trichoptera: *Brachycentrus*	6	0	0	0	36	6	0	6	0	24	0	0
Trichoptera: *Hydropsyche*	18	1030	0	394	1097	1024	0	1254	424	1321	0	242
Trichoptera: *Hydroptila*	0	0	6	0	42	0	0	0	0	36	36	0
Trichoptera: *Neothremma*	0	0	0	6	0	0	0	0	0	0	6	6
Trichoptera: *Ochrotricia*	0	0	0	0	0	0	951	0	0	0	0	6
Trichoptera: *Oligophlebodes*	0	0	0	0	0	0	0	0	0	6	0	0
Trichoptera: *Rhyacophila*	0	0	0	0	6	12	0	0	6	0	0	0

Trichoptera: *Tinodes*	0	0	0	0	0	0	6	0	0	0	0	0
Coleoptera: *Optioservus*	0	0	0	0	18	6	0	0	0	24	0	6
Coleoptera: *Peltodytes*	0	0	6	0	0	0	0	0	0	0	0	0
Diptera: Ceratopogonidae	0	0	0	0	0	0	0	6	0	0	6	0
Diptera: *Chelifera* (Empididae)	0	60	12	0	0	0	0	224	0	0	0	521
Diptera: Chironomidae larvae	3163	12	3837	479	6121	12	7042	642	3545	97	2424	1036
Diptera: Chironomidae pupae	176	0	97	0	218	0	358	188	164	0	121	67
Diptera: Tipulidae *Antocha*	0	6	0	0	0	12	0	0	0	27	10	97
Diptera: Tipulidae *Tipula*	0	12	0	0	6	0	0	12	15	0	0	0
Diptera: Allognasa (Stratiomyidae)	0	6	0	0	0	0	0	0	0	0	0	0
Gyraulus	0	0	0	0	0	0	1	6	0	0	0	0
Sphaerium	0	0	0	0	0	0	0	6	0	0	0	0
Cladocera	0	0	551	0	0	0	909	0	0	0	576	0
Copepoda	0	0	467	0	6	0	12	0	0	0	18	0
Ostracoda	0	12	467	0	0	0	0	0	0	0	6	0
Hydracarina	0	12	91	364	0	0	0	0	0	0	91	6
Oligochaeta	79	79	442	24	654	0	879	24	576	0	103	1079
Tricladida	0	6	0	0	6	0	0	0	0	0	0	0
totals	3703	1260	6265	1267	8757	1491	10351	5004	4927	2879	3387	16919

that detrital input and/or retention has been compromised and that sediments are being flushed from the system. As emphasized in previous reports (Shiozawa 2002a, b, c) the community is unlikely to return to the structure that existed in 1979 unless the sustained discharge is eliminated. If and when that occurs, the trajectory of the recovering community should resume towards the 1979 state. In part that will depend on the upper basin tributaries inputting additional sediments and detritus to help reestablish the low summer through winter discharge profile that would have existed in the late 1970s.

Biomass

Total biomass for each site (Table 5) was determined. Such estimates give insight into the actual partitioning of energy stored in the living system at different locations and time periods. It appears that the appropriate comparisons are by seasons. The October 2003 samples should be compared with the October 2002 samples. Both the middle (EC4) and lower (EC5) sites had their highest standing crop in October of 2003. The data also indicate a tendency for fall biomass to be higher than the spring biomass. The high biomass in EC4 is likely due to the high numbers of Hydropsychids and the presence of the detritivorous tipulids. The lowest station (EC5), had high densities of *Baetis*, chironomids, and oligochaetes, which were important in the overall standing crop estimates. Interestingly, no tipulids were collected at this lower station, even though the habitat should support them. Upper Eccles (EC2) was a third less than the previous fall's biomass, indicating that the upstream most station is declining whle the other two stations are increasing in biomass. The lack of detritivores, low densities of hydropsychids and lack of *Baetis* in station EC2 are affecting the total biomass estimates.

Table 5. Biomass, comparisons October 2002 with June 2003.

	Upper Eccles (EC2)			Middle Eccles (EC4)			Lower Eccles (EC5)		
Sample	Oct 2002	June 2003	Oct 2003	Oct 2002	June 2003	Oct 2003	Oct 2002	June 2003	Oct 2003
1	0.58 g	0.13 g	0.23 g	0.24 g	0.14 g	1.39 g	0.21 g	0.14 g	0.41 g
2	0.34 g	0.31 g	0.13 g	0.40 g	0.10 g	0.59 g	0.04 g	0.07 g	0.19 g
3	0.07 g	0.05 g	0.06 g	0.27 g	0.06 g	0.50 g	0.40 g	0.01 g	0.37 g
4	0.31 g	0.04 g	0.28 g	0.05 g	0.12 g	0.19 g	0.43 g	0.05 g	0.64 g
5	0.29 g	0.11 g	0.33 g	0.07 g	0.24 g	0.43 g	0.10 g	0.10 g	0.03 g
total	1.59 g	1.03 g	1.03 g	1.03 g	0.66 g	3.1 g	1.18 g	0.37 g	1.64 g
per m^2	9.64 g/m^2	3.88 g/m^2	6.24 g/m^2	6.24 g/m^2	4.00 g/m^2	18.82 g/m^2	7.15 g/m^2	2.24 g/m^2	9.95 g/m^2

Biotic Condition Index

Community tolerance quotients are a part of the biotic condition index developed by Winget and Mangum (1979). The community tolerance quotients are of two types, the actual community tolerance quotient, CTQa, and the predicted community tolerance quotient, CTQp. The predicted community tolerance quotient is based on water chemistry, substrate, and gradient, and was determined to be 80 using the directions in Winget and Mangum (1979). CTQa values are a simple arithmetic mean of preassigned index values for the taxa present at a given station. The CTQa indices for the October 2003 samples and an idealized stream, based on a combination of taxa collected from Boardinghouse Creek in November of 2001 and all taxa collected in Eccles Creek from 2001-2003 are presented in Table 6.

Generally CTQa values less than 65 represent high quality waters, while those between 65 and 80 represent situations with moderate to high quality water. CTQa values greater than 80 represent low water quality or stressed systems. The October 2003 stations had CTQa values of 88, 76.75, and 71.3 at stations EC2, EC4, and EC5 respectively. In June all stations were greater than 80, thus indicating water quality problems. In October 2002 the sample from Eccles Creek above South Fork (EC2) had a CTQa value of 86.2, slightly lower than the June 2003 value, but both Eccles Creek at Whisky Canyon (EC4) and Lower Eccles Creek (EC5) had values representing moderate to high quality conditions (68.6 and 69.0 respectively). All three stations showed in increase in stress from October 2002 to June of 2003. The October 2003 samples for EC2 have a slightly higher CTQa value than in the fall of 2002 and the remaining two sites were also higher in October of 2003. This indicates a slight decrease in habitat quality. Both EC4 and EC5 still qualify for moderate to high water quality based on the CTQa criteria. Nevertheless, these values are better than the 93.6 CTQa for the fall of 2001.

Table 6. Tolerance quotients.

Eccles Creek, October 2003 Taxa	above South Fork (EC2)	at Whisky Canyon (EC4)	Lower Eccles (EC5)	Ideal stream (species list, including Boarding-house Creek)
Ephemeroptera: Baetidae: Baetis	0	72	72	72
Ephemeroptera: Ephemerellidae: *Drunella sp.*	0	0	0	48
Ephemeroptera: Ephemerellidae: *Drunella dodsei*	0	0	0	4
Ephemeroptera: Ephemerellidae: *Seratella*	0	0	0	48
Ephemeroptera: Ephemerellidae: *Ephemerella*	0	0	0	48
Ephemeroptera: Heptageniidae: *Cinygmula*	0	21	0	21
Ephemeroptera: Heptageniidae: *Epeorus*	0	0	21	21
Ephemeroptera: Leptophlebidae: *Paraleptophlebia*	0	0	0	24

Plecoptera early instar	0	0	36	36
Plecoptera: Nemouridae: *Malenka californica*	0	0	0	36
Plecoptera: Nemouridae: *Zapada*	0	0	0	16
Plecoptera: Perlididae: *Hesperoperla pacifica*	0	18	18	18
Plecoptera: Perlodidae: *Skwalla parallela*	0	18	0	18
Plecoptera: Perlodidae: *Isoperla*	0	0	0	48
Trichoptera: pupae	0	0	0	108
Trichoptera: Brachycentridae: *Brachycentrus*	0	0	0	24
Trichoptera: Brachycentridae: *Micrasema*	0	0	0	24
Trichoptera: Hydropsychidae: *Arctopsyche*	0	0	0	18
Trichoptera: Hydropsychidae: *Hydropsyche*	108	108	108	108
Trichoptera: Hydroptilidae: *Hydroptila*	0	0	0	108
Trichoptera: Hydroptilidae: *Ochrotricia*	0	0	108	108
Trichoptera: Limnephilidae: *Dicosmecus*	0	0	0	24
Trichoptera: Psychomyiidae: *Tinodes*	0	0	0	108
Trichoptera: Rhyacophilidae: *Rhyacophila*	0	0	0	18
Trichoptera: Uenoidae: *Neothremma alica*	8	0	8	8
Trichoptera: Uenoidae: *Oligoplebodes*	0	0	0	24
Coleoptera: Elmidae: *Optioservus*	0	0	108	108
Coleoptera: Haliplidae: *Peltodytes*	0	0	0	54
Diptera: Ceratopogonidae	0	108	0	108
Diptera: Chironomidae	108	108	108	108
Diptera: Empidae: *Chelifera*	0	108	108	108
Diptera: Simuliidae: *Simulium*	0	0	0	108
Diptera: Tipulidae *Dicranota*	0	0	0	24
Diptera: Tipulidae *Limnophila*	0	0	0	72
Diptera: Tipulidae *Tipula*	0	36	0	36
Diptera: Tipulidae *Pedicea*	0	0	0	72
Diptera: Tipulidae *Antocha*	0	0	24	24
Diptera: Stratiomyidae: *Allognasa*	0	0	0	108

Collembola	0	0	0	108
Hemiptera: Saldidae	0	0	0	108
Acari: Hydracarnia	108	0	108	108
Ostracoda	0	0	0	108
Copepoda	0	0	0	108
Cladocera	0	0	0	108
Mollusca: Gastropoda *Gyraulus*	0	108	0	108
Mollusca: Spharidae *Sphaerium*	0	108	0	108
Oligochaeta	108	108	108	108
Tricladida Planariidae	0	0	0	108
total	440	921	927	3148
n	5	12	13	48
CTQa	88	76.75	71.3	65.58

Comparisons of Community Tolerance Quotient and Biotic Comparison Indices

CTQa values for Eccles Creek can be compared from the 1979, 1990, and 2000-2003 time periods. These values detected the impact in the 1990s in three stations below the mine (EC1, EC2 and EC4; Table 7). That impact did not reach the lowest station, EC5. Beginning in 2001 the average CTQa for the stream jumped to 94 and stayed above 70 in 2002, in June of 2003 it was 93, and in the fall of 2003 it was 78. The additional inflow has had a more intense impact on the stream than the 1990 detergent spill.

The biotic condition index (BCI) is simply CTQp/CTQa X 100. This measure, according to Winget and Mangum (1979), can be used in conjunction with CTQa to generate a broader interpretation of the state of the stream system. Ideally, if all predictors are accurate, a pristine system will have a BCI of 100 (CTQp = CTQa). BCI values below 100 represent a condition where fewer clean water taxa than predicted are present and thus indicate a reduction in the quality of the habitat. Any BCI value above 100 represents communities whose clean water taxa are in greater abundance than predicted. In 32 of the 40 sample stations presented in this report (Table 6) the BCI was over 100. None of the stations sampled in June 2003 had a BCI value above 100 but all three station were above 100 in the October 2003 samples. This suggests that the three stations in October of 2003 have recovered and exceed the expected clean water conditions for that stream system. However, the BCI values generated in previous studies of Eccles Creek indicate that the CTQp is systematically biased and over estimates the expected average community tolerance quotient. However that implies that a BCI value less than 90 or 100 is a strong indication of a problem in the system.

In this latest series of samples (October 2003) the BCI indicates that the clean water taxa are approximately what would be predicted to be present based on water chemistry of the drainage.

able 7. CTQa and BCI values for selected studies on Eccles Creek.

	Winget 1980		Ecosystems Research Institute 1992			Shiozawa 2002a	Shiozawa 2002c	Shiozawa 2003	Shiozawa &Hansen 2004	This report
Sampling date	May-June 1979	Aug 1979	June 1990	Oct 1990	Sept 1991	Nov 2001	July 2002	Oct 2002	June 2003	October 2003
	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI	CTQa /BCI
South Fork tributary above mine, upper site USF2)			59/133	53/151						
South Fork tributary above mine (USF)			49/163	59/136	45/178					
Middle Fork tributary above mine (UMF)			54/148	49/163						
Eccles Creek below mine EC1)			67/119	108/74						
Eccles Creek above south Fork (EC2)		65/123			73/110		99/81	86/93	87/92	88/91
South Fork Eccles Creek SF)	59/136	64/125	55/145							
Eccles Creek below South Fork (EC3)	65/123	55/145								
Eccles Creek at Whisky Canyon (EC4)	62/127	61/131	69/116	70/114	63/127	94/85	52/154	69/116	94 /79	76/105
Lower Eccles Creek EC5)	59/136	74/108	53/151	55/145 57/140	58/138		66/121	69/116	97/82	71/112
Average	62/131	64/126	59/140	64/132	60/138	94/85	72/119	75/108	93/86	78/102

Since the BCI is a function of the taxa present, if we had collected just one *Neothremma* at one of the sites with no other taxa present, the CTQa would be 8 and the BCI would be 1000. We would conclude that the stream was in excellent condition even though no other taxa were found. This extreme example may appear to be unrealistic, but one must consider that in our data set we are comparing CTQa values for 5 to 13 taxa with a system that once had 30 to 40 taxa. This inherent weakness in the BCI must be recognized when interpreting the data.

One additional habitat measure, based on the BCI, can be explored. Winget and Mangum (1979, page 14) classify habitat quality based on the combination of the CTQa and BCI values (Table 8). The table provided on page 14 by Winget and Mangum, 1979 has an error, condition 4 should list the BCI as >70 rather than <70). These habitat quality designations can be used as general BCI generated statements of the condition of the stream in 1979, 1990-91 and 2001-03.

The habitat quality measures for Eccles Creek in 1990-91 do appear to have detected the impact of the mine spill and sedimentation. Stream reaches and tributaries outside of the influence of the mine are rated as high quality habitats while those below (EC1, EC2, and EC4) show signs of impact, being rated as low or high to moderate habitat quality. Additionally, the 2001 and 2002 data showed either high-moderate habitat quality or low habitat quality. Station (EC4), in July of 2002, received a high habitat quality rating, even though the number of taxa and densities indicated that the site was been heavily impacted. Station EC2 in July 2002 and October 2002 had high-moderate habitat quality, yet again the number of taxa and densities are far from the baseline states for both dates. In addition the November 2001 samples, which had a total of just six taxa (Table 1) and a density of 61 per square meter (Table 2), was rated as having high-moderate habitat quality. The June 2003 sample stations all had low habitat quality. The October 2003 samples gave station EC2 a high-moderate listing. The other two sites, EC1, and EC4, where more taxa were found, received low habitat quality ratings. While this index is indicating that the system is still in need of improvement, the classification of EC2, which is the most impacted site based on other measures, as having the highest habitat quality of the three sites demonstrates the inherent weakness of this approach. For this and reasons expressed elsewhere (Shiozawa and Hansen 2004) the CTQa and BCI values cannot be relied upon as stand alone indicators of stream condition.

Diversity Index

Diversity indices are a way of combing both number of taxa and relative densities into a single measurement. High diversity index values indicate more taxa and a more even number of individuals per taxon. Low diversity values generally reflect a depauperate fauna in both species and somewhat in numbers, although high densities of a few taxa will lower diversity scores. The baseline stations (the 1979 samples; Table 8) had diversity values ranging between about 2 to 3. The areas impacted in 1990-91 had diversities values around 1. But in September 1991 the index values fell to around 0.5.

Diversity from 2001-2002 was below 1.0 for all sampled stations. In June 2003 EC4 and EC5 were slightly below the July, 2002 levels, and EC2 was above 1.0 for the first time. The diversity levels of June 2003 were still far from the values of 2 or 3 that characterized the

Table 8. Habitat quality based on CTQa and BCI values for selected studies on Eccles Creek.

	Winget 1980		Ecosystems Research Institute 1992			Shiozawa 2002a	Shiozawa 2002c	Shiozawa 2003	Shiozawa & Hansen 2004	This report
Sampling date	May-June 1979	Aug 1979	June 1990	Oct 1990	Sept 1991	Nov 2001	July 2002	Oct 2002	June 2003	Oct 2003
South Fork tributary above mine, upper site (USF2)			high	high						
South Fork tributary above mine (USF)			high	high	high					
Middle Fork tributary above mine (UMF)			high	high						
Eccles Creek below mine (EC1)			low	high-moderate						
Eccles Creek above south Fork (EC2)		low			low		high-moderate	high-moderate	low	high-moderate
South Fork Eccles Creek (SF)	high	high	high							
Eccles Creek below South Fork (EC3)	low	high								
Eccles Creek at Whisky Canyon (EC4)	high	high	low	low	high	high-moderate	high	low	low	low
Lower Eccles Creek (EC5)	high	low	high	high/high	high		low	low	low	low

baseline data taken in the late 1970s. The October samples had two stations, EC2 and EC4, that had diversity values above 1. The higher diversity in EC2 is associated with the eveness of distribution of the counts of the five taxa, since diversity takes in to account not only the number of taxa but also the distribution of the counts. Still, the diversity values indicate that the stream has improved slightly from the conditions in 2001-2002, but that the stream is still not near the status it had in the late 1970s.

Cluster Analysis

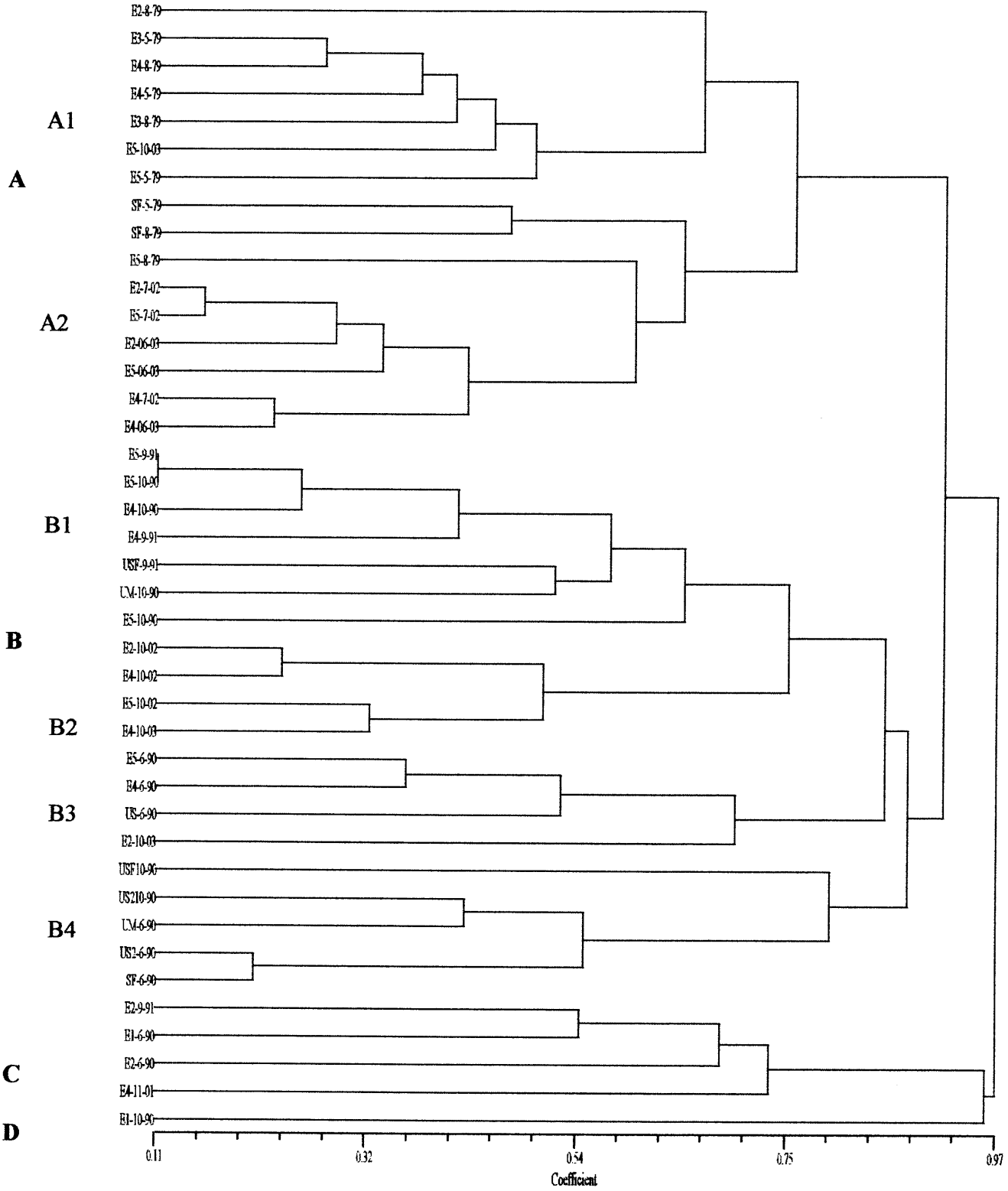
The final analysis utilized in this study was clustering. This is a multivariate approach that generates a visual representation of the relationships among samples. The dissimilarity index utilized in the study considers both quantitative counts of individuals within each taxon and the relative densities of those organisms. The cluster results (Figure 1) separate the samples into four clusters, labeled A, B, C, and D. The most dissimilar two clusters, C and D, contain samples from the 1990's series plus one station from 2001 (in Cluster C). The other two clusters, A and B, contain a mixture of sample sites and dates, but the spring-summer samples from 1979 and the spring-summer samples from 2002-2003 combine to form one cluster, cluster A, with the 2002-2003 spring-summer samples (cluster C2) showing a clear dissimilarity (at approximately 75% dissimilarity) from the 1979 samples (cluster C1). The other major cluster, cluster B, contains the fall samples from 2002 and 2003 (with one exception to be discussed below), and most of the samples from 1990-91. This seasonality is reasonably distinct and one can trace the changes in the 2000 sample stations by tracing where they fall with the clusters. They mainly alternate between cluster A2 in the spring and B2 in the fall.

Station EC2 clearly switched between clusters A2 in the spring-summer and cluster B2 in the fall. However the fall 2003 samples show a shift to cluster B3, being more similar to samples from 1990 than to other samples taken in 2002-2003. Whether this shift is due to a temporary difference or if it is a permanent shift associated with changes in habitat at the upstream station cannot be evaluated at this time. Future samples should give a better appraisal of this.

The first sample series taken in the fall of 2001 came from station EC4 (E4 on the figure). This sample clusters with major cluster C rather than cluster B2, suggesting that the initial high flows resulted in changes at station EC4 that were similar to some of the 1990 impacts. However within eight months the station had shifted to the seasonal cycles typical of stations EC4 and EC5 (E5 on the figure) for 2002-2003. The July 2002 samples cluster in C2, the spring summer group. The October 2002 EC4 sample was in cluster B2, and the June 2003 EC4 sample was again in cluster A2. The October 2003 EC4 sample was in cluster B2. This station has clearly illustrated the seasonal oscillations.

Station EC5 followed the same pattern as Station EC4 with one exception. The last sample series, October 2003 shifted to cluster A1 instead of B2. Cluster A1 contains the 1979 samples and this shift in station EC5 could be indicative of recovery. If this is a valid trend we would expect that the 2004 series will also cluster in the same group.

Figure 1. UPGMA Cluster dendrogram of relationships among invertebrate communities from selected stations and dates in Eccles Creek. Major clusters (designated **A, B, C, D**) and sub clusters (designated A1, A2, B1-B4) labeled on left margin.



CONCLUSIONS

Eccles Creek in October of 2003 was still showing impacts from the increased inflow of water. The most appropriate comparisons for summarizing the changes in the communities are with the Fall 2002 samples.

The number of taxa in station EC2 fell in the October 2003 samples, although the total density of organisms at EC2 remained about the same as in the previous fall samples. However this was due to an increase in chironomids, off setting the decrease in hydropsychids. As a result biomass at station EC2 declined. The CTQa value for station EC2 was up just slightly, to 88, over the previous fall, and the BCI was 91, indicating that the CTQa was close to the value predicted for this system based on water chemistry and gradient. The combination of CTQa and BCI indicated that the habitat quality at station EC2 was moderate to high. The diversity index for this station was higher than the previous fall, moving to 1.190 from 0.836 the previous fall. This increase in diversity, despite the fall in number of taxa from 11 to 5, reflected the eveness in the distribution of densities of the remaining taxa. The cluster analysis placed station EC2 in the 1990 impact group for the fall of 2003, rather than in the usual fall cluster for the 2002-2003 sample series. This indicates that the system may have regressed in condition. Observations made while sampling indicate that station EC2 has been scoured to and armored by bedrock and carbonate cemented substrates. This has reduced habitat heterogeneity and detrital retaining capacity within the stream channel at this station.

Station EC4 with 13 taxa almost doubled the number of taxa from the previous fall when 7 were collected. *Baetis*, *Hydropsyche*, *Chelifera*, chironomids and tipulids all increased. This resulted in an increase in biomass. The CTQa of 76 was slightly higher than in the fall of 2002, and indicates that station EC4 has more clean water species than station EC2. The BCI value was 105, indicating that the tolerance quotient was slightly better than predicted from physical parameters. This system was given a low quality rating based on the CTQa and BCI criteria. The diversity index for this station was 1.432, up from the previous fall diversity value of 0.835, and was the highest diversity value recorded in the system since the increase in discharge in 2001. However cluster analysis shows this station continuing in the seasonal cycle with no tendency to either improve towards the base line condition of 1979, nor to regress to more impacted conditions as did station EC2. Station EC4 at this period in time has not made appreciable changes over its condition in 2002, although the increase in taxa and diversity suggest that it may improve over time. This improvement may be offset if the conditions that appear to be taking place in EC2 continue to extend downstream with time.

Station EC5 had the same number of taxa that it had in the fall of 2002 although densities increased. *Baetis*, *Chelifera*, and chironomids increased in abundance, but *Hydropsyche* decreased. The total biomass of the system increased slightly over the fall of 2002. The CTQa, at 71 was just slightly higher than the previous fall, and the BCI was 112 indicating again that this station was better than predicted by physical parameters. This still resulted in the rating of this station as having low habitat quality. The diversity index was 0.750, up from 0.341 the previous fall. While diversity was low, the species present and their relative densities resulted in the station clustering weakly with the 1979 sample group, suggesting that this station was becoming more similar to the baseline conditions than

any of the other stations. This apparent trend towards recovery is still far from where it should be, since diversity values of 2.2 or greater and at least 22 taxa were collected in the baseline studies. In addition, the conditions in the lower station may be facilitated in part by the downstream transport of sediments for the upper reaches. If a wave of erosive transport is gradually moving materials downstream, it could eventually generate station EC2 conditions at station EC5.

LITERATURE CITED

EarthFax Engineering. 2001. Memo to Chris Hansen of Canyon Fuel Company, Skyline Mine. October 24, 2001.

Ecosystems Research Institute. 1992. Eccles Creek Invertebrate studies and rock dissolution experiments. Report to Skyline Mines. Utah Fuel Company. Coastal States Energy Company.

Krebs, C. J. 1989. Ecological methodology. Harper and Row Pub. Inc. NY, NY 654 pp.

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

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

Poole, R. W. 1974. An introduction to quantitative ecology. McGraw-Hill, Inc. 532pp.

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

Shiozawa, D. K. 2002a. The Benthos of Bordinghouse & Eccles Creeks and the Impact of Increased Water Discharge Into Eccles Creek in 2001. Report to Canyon Fuel Co, LLC. Skyline Mines. February 2002.

Shiozawa, D. K. 2002b. A compilation and comparison of the Eccles Creek macro-invertebrate data for the period of 1979-2002. Report to Canyon Fuel Co, LLC. Skyline Mines. September 2002.

Shiozawa, D. K. 2002c. The benthos Eccles Creek and the impact of increased water discharge in 2002. . Report to Canyon Fuel Co, LLC. Skyline Mines. October 2002.

Shiozawa, D. K. 2003. Eccles Creek benthic invertebrate monitoring, October, 2002. Report to Canyon Fuel Co, LLC. Skyline Mines. June 2003.

Shiozawa, D. K. And J. Hansen. 2004. Eccles Creek benthic invertebrate monitoring, June, 2003. Report to Canyon Fuel Co, LLC. Skyline Mines. August 2004.

Winget, R. N. 1980. Aquatic Ecology of surface waters associated with the Skyline Project, Coastal States Energy Company. General Aquatic Resource Description. Report to Coastal States Energy Company.

Winget, R. N. and F. A. Mangum. 1979. Biotic condition index: integrated biological, physical, and chemical stream parameters for management. U. S. Forest Service Intermountain Region. Ogden, UT.

APPENDIX C

Legal Financial, Compliance and Related Information

Annual Report of Officers
As submitted to the Utah Department of Commerce

Other change in ownership and control information
As required under R645-301-110

CONTENTS

None – Submitted in February 2005

APPENDIX D

Mine Maps

As required under R645-302-525-270

CONTENTS

Skyline Mine, Mine 3 Levels 2 and 3, 2004 As-Mined
Skyline Mine Projected Mining 2005 - 2014

APPENDIX E

Other Information

In accordance with the requirements of R645-301 and R645-302

CONTENTS

None