GENERAL INFORMATION

1. Permit Number	ACT/007/038
2. Mine Name	Willow Creek Mine
3. Permittee Name	Cyprus Plateau Mining Corporation
4. Operator Name (if other than Permittee)	
5. Permit Expiration Date	April 23, 2001
6. Company Representative, Title	Johnny Pappas, Sr. Environmental Engineer
7. Phone Number	(435) 472-4741
8. Fax Number	(435) 472-4782
9. Mailing Address	Cyprus Plateau Mining Corporation
	847 Northwest Highway 191
	Helper, Utah 84526
10. Resident Agent, Title	C.T. Corporation System
Mailing Address	50 West Broadway
	Salt Lake City, Utah 84101

IDENTIFICATION OF OTHER PERMITS

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

Permit Type	ID Number	Description	Expires on
1. MSHA Mine ID(s)	42-02113	Legal Identity	
2. MSHA Impoundment(s)	1211-UT-09-00165-02	Sediment Pond 013	
	1211-UT-09-00165-01	Refuse Pile	
3. NPDES/UPDES Permit(s) (water)	UTG040012	UPDES Permit	4/30/98
4. PSD (Air) Permit(s)	DAQE-209-99	Approval Order	
5.			

File in:
- ❑ Confidential
- ❑ Shelf
- X Expandable

Refer to Record No 0013 Date 05/14/1999
In C/007/038, 1999, Incoming
For additional information

0013

COPY

CYPRUS PLATEAU MINING CORPORATION
A Cyprus Amax Company

Willow Creek Mine
847 Northwest Highway 191
Helper, Utah 84526
(435) 472-0475
Fax: (435) 472-4780

May 14, 1999

Utah Coal Regulatory Program
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Attention: Pamela Grubaugh-Littig

RE: Submittal of Annual Report for 1998, Cyprus Plateau Mining Corporation, Willow Creek Mine, ACT/007/038, Folder #2, Carbon County, Utah

Dear Ms. Grubaugh-Littig:

Enclosed please find two copies of the aforementioned. Due to the way we assembled our annual report, we are unable to provide the information in the fashion requested by the Division.

If you have any questions, please do not hesitate to contact me at (435) 472-4741.

Sincerely,

Johnny Pappas
Sr. Environmental Engineer

Enclosures

File: WCENV 2.5.2.1.8
Chrono: JP990509.LTR

File in:
C0070038 1999, Incoming
Refer to:
☐ Confidential
☐ Shelf
☒ Expandable
Date 05/14/99 for additional information

6.			

CERTIFIED REPORTS

List the certified inspection reports as required by the rules and under the approved plan which must be periodically submitted to the Division. Specify whether the information is included as APPENDIX A to this Annual Report or currently ON FILE with the Division.

Certified Reports:	Reports Required?		INCLUDED or ON FILE w/DOGM?			Comments
	YES	NO	YES	NO	ON FILE	
1. Excess Spoil Piles		X				
2. Refuse Piles	X		X			
3. Impoundments	X		X			
4.						
5.						

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 Annual Report or currently ON FILE with the Division.

Technical Data:	Reports Required?		INCLUDED or ON FILE w/DOGM?			Comments
	YES	NO	YES	NO	ON FILE	
1. Climatological Data		X				
2. Subsidence Monitoring Data	X		X			
3. Vegetation Monitoring Data		X				
4. Raptor Data	X				X	Submitted with Permit Update
5. Soils Monitoring Data		X				
6. Water Monitoring Data	X				X	
First Quarter Report	X				X	
Second Quarter Report	X				X	
Third Quarter Report	X				X	
Fourth Quarter Report	X				X	
7. Geological/Geophysical Data		X				
8. Engineering Data		X				
9. Other Data						

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

Changes 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. 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 changes 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 any 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 this Annual Report.

Legal/Financial Data:	Report Required?		INCLUDED or ON FILE w/DOGM?			Comments
	YES	NO	YES	NO	ON FILE	
1. Department of Commerce, Annual Report of Officers	X		X			
2. Other						

MINE MAPS

Copies of mine maps, current and up-to-date through at least December 31, 1998, are to be provided to the Division as APPENDIX D to this Annual Report in accordance with the requirements of R645-301-525.270. These map copies shall be made in accordance with 30 CFR 75.1200, as required by MSHA. Upon request, mine maps shall be kept confidential by the Division.

Map Number(s)	Map Title / Description	Confidential?
Map 2	Willow Creek Mine - 1998 Production Map	

OTHER INFORMATION

Please provide any comments or further information to be included as part of the Annual Report. Any other attachments are to be provided as APPENDIX E to this Annual Report.

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

Response to Corps of Engineers Permit Special Condition #12 - Channel Stability

Division of Wildlife Resources Aquatic Monitoring Request - Fish Monitoring Study

APPENDIX A

Certified Reports

Excess Spoil Piles
Refuse Piles
Impoundments

as required under R645-301-514

CONTENTS

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 001 *LOCATION:* Willow Creek

IMPOUNDMENTS:	
(1) Stability	Stable - New Pond.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	Some oil rings around pond.
(4) Depth of Impounded Water	2' - 3' Frozen.
(5) Existing Storage Capacity	6.08 ac. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	6161.0
(8) Sediment Cleanout Level (Elev.)	6163.3
(9) Principle Spillway (Elev.)	6169.5
(10) Emergency Spillway (Elev.)	6170.0
(11) Existing Sediment Capacity (To Cleanout)	1.42 ac. ft.
GENERAL:	
(12) Comments/Recommendations	Some oil evident - being skimmed off. 2 Rip-Rapped Inlets - O.K. 1 Ditch Inlet along ramp - O.K. Pipe and Open Channel Spillways.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 002 *LOCATION:* Willow Creek

IMPOUNDMENTS:	
(1) Stability	Slopes Stable/Incised.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	N/A - Dry.
(5) Existing Storage Capacity	0.24 ac. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	6149.90
(8) Sediment Cleanout Level (Elev.)	6151.30
(9) Principle Spillway (Elev.)	6156.50
(10) Emergency Spillway (Elev.)	6156.50
(11) Existing Sediment Capacity (To Cleanout)	0.021 ac. ft.
GENERAL:	
(12) Comments/Recommendations	New Pond - 1997. Open Channel Emergency Spillway. 2 Inlets - O.K.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 011 *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Slopes Stable/Incised.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	1' - 2' Frozen.
(5) Existing Storage Capacity	1.68 ac. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	6133.0
(8) Sediment Cleanout Level (Elev.)	6136.1
(9) Principle Spillway (Elev.)	6147.0
(10) Emergency Spillway (Elev.)	6148.0
(11) Existing Sediment Capacity (To Cleanout)	0.15 ac. ft.
GENERAL:	
(12) Comments/Recommendations	Pond Reconstructed.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 12A *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Slopes Stable/Incised.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	1.5' - 2' Frozen.
(5) Existing Storage Capacity	41,391 cu. ft.
(6) Monitoring Procedures	Quarterly Inspection.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	93.5
(8) Sediment Cleanout Level (Elev.)	94.4
(9) Principle Spillway (Elev.)	97.3
(10) Emergency Spillway (Elev.)	98.3
(11) Existing Sediment Capacity (To Cleanout)	11,692 cu. ft.
GENERAL:	
(12) Comments/Recommendations	No Discharge. Open Channel Spillway. Elevations Relative to Dam Elevation of 100.00.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 12B *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Stable.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	1.5'
(5) Existing Storage Capacity	2.26 ac. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	6093.00
(8) Sediment Cleanout Level (Elev.)	6094.00
(9) Principle Spillway (Elev.)	6099.50
(10) Emergency Spillway (Elev.)	6100.00
(11) Existing Sediment Capacity (To Cleanout)	0.41 ac. ft.
GENERAL:	
(12) Comments/Recommendations	Pond Reconstructed - 1997. 4 Culvert Inlets - O.K. Pipe and Open Channel Outlets - O.K. Grouted Rip-Rap.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 013 *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Slopes Stable/Mostly Incised.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	Oil ring evident around Pond.
(4) Depth of Impounded Water	2' - Frozen.
(5) Existing Storage Capacity	5.75 ac. ft.
(6) Monitoring Procedures	Weekly inspection per M.S.H.A. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	6190.84
(8) Sediment Cleanout Level (Elev.)	6196.34
(9) Principle Spillway (Elev.)	6205.84
(10) Emergency Spillway (Elev.)	6205.84
(11) Existing Sediment Capacity (To Cleanout)	1.38 ac. ft.
GENERAL:	
(12) Comments/Recommendations	No Discharge. Open Channel Spillway. M.S.H.A. Pond ID-1211-UT-09-00-165-02.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 014 *LOCATION:* Crandall Canyon

IMPOUNDMENTS:	
(1) Stability	Slopes Stable.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	2.5' - Frozen.
(5) Existing Storage Capacity	31,576 cu. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	89.5
(8) Sediment Cleanout Level (Elev.)	90.8
(9) Principle Spillway (Elev.)	95.3
(10) Emergency Spillway (Elev.)	97.0
(11) Existing Sediment Capacity (To Cleanout)	8,511 cu. ft.
GENERAL:	
(12) Comments/Recommendations	No Discharge. Dual Culvert Spillways. Elevations Relative to Dam Elevation of 100.00.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Sed. Pond 015 *LOCATION:* Crandall Canyon

IMPOUNDMENTS:	
(1) Stability	Slopes Stable.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	Mostly Dry. Frozen.
(5) Existing Storage Capacity	39,258 cu. ft.
(6) Monitoring Procedures	Quarterly Inspection. U.P.D.E.S.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	90.4
(8) Sediment Cleanout Level (Elev.)	94.0
(9) Principle Spillway (Elev.)	98.2
(10) Emergency Spillway (Elev.)	99.6
(11) Existing Sediment Capacity (To Cleanout)	12,767 cu. ft.
GENERAL:	
(12) Comments/Recommendations	No Discharge. Open Channel Spillway. Elevations Relative to Dam Elevation of 101.00.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Wash Plant Feed Pond *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Slopes Stable. Rubber lined pond.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	Full - 5.0' Frozen on surface.
(5) Existing Storage Capacity	3.62 ac. ft. when full.
(6) Monitoring Procedures	Quarterly Inspection.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	N/A
(8) Sediment Cleanout Level (Elev.)	N/A
(9) Principle Spillway (Elev.)	N/A
(10) Emergency Spillway (Elev.)	N/A
(11) Existing Sediment Capacity (To Cleanout)	N/A
GENERAL:	
(12) Comments/Recommendations	Not a Sediment Pond.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

CYPRUS PLATEAU MINING CORPORATION
1998 ANNUAL POND INSPECTION REPORT

POND: Thickener Pond *LOCATION:* Castle Gate

IMPOUNDMENTS:	
(1) Stability	Slopes Stable/Mostly Incised.
(2) Structural Weakness/Erosion	None Noted.
(3) Potential Safety Hazards	None Noted.
(4) Depth of Impounded Water	N/A - Dry, small frozen patches.
(5) Existing Storage Capacity	7.25 ac. ft.
(6) Monitoring Procedures	Quarterly Inspection.
SEDIMENT PONDS ONLY:	
(7) Sediment Accumulation (Elev.)	N/A
(8) Sediment Cleanout Level (Elev.)	N/A
(9) Principle Spillway (Elev.)	N/A
(10) Emergency Spillway (Elev.)	N/A
(11) Existing Sediment Capacity (To Cleanout)	N/A
GENERAL:	
(12) Comments/Recommendations	Not a Sediment Pond.

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 meets or exceeds 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.

Dan W. Guy
(Signature)

12/28/98
(Date)

Cyprus Plateau Mining Corporation
Quarterly Refuse Pile Certification
First Quarter 1998

I hereby certify that I am a registered professional engineer in the State of Utah. I certify that I have made an inspection of the coal processing refuse pile at Cyprus Plateau Mining Corporations' Willow Creek Mine in Carbon County Utah. The refuse pile has been constructed and maintained as designed. There are no apparent areas of instability, structural weakness or other hazardous conditions. The piezometer monitoring wells are dry.

REGISTERED PROFESSIONAL ENGINEER
NO. 159412
DANIEL THOMAS HURST
STATE OF UTAH

Daniel Thomas Hurst

Date: 3/31/98

Cyprus Plateau Mining Corporation
Quarterly Refuse Pile Certification
Second Quarter 1998

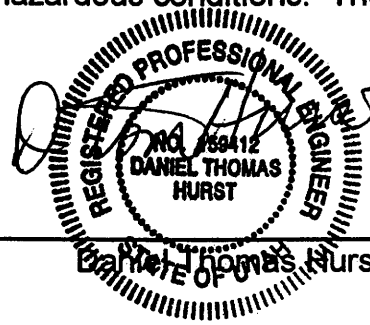
I hereby certify that I am a registered professional engineer in the State of Utah. I certify that I have made an inspection of the coal processing refuse pile at Cyprus Plateau Mining Corporations' Willow Creek Mine in Carbon County Utah. The refuse pile has been constructed and maintained as designed. There are no apparent areas of instability, structural weakness or other hazardous conditions. The piezometer monitoring wells are dry.

REGISTERED PROFESSIONAL ENGINEER
NO. 159412
DANIEL THOMAS HURST
STATE OF UTAH

Daniel Thomas Hurst Date: 6/30/98

Cyprus Plateau Mining Corporation
Quarterly Refuse Pile Certification
Third Quarter 1998

I hereby certify that I am a registered professional engineer in the State of Utah. I certify that I have made an inspection of the coal processing refuse pile at Cyprus Plateau Mining Corporations' Willow Creek Mine in Carbon County Utah. The refuse pile has been constructed and maintained as designed. There are no apparent areas of instability, structural weakness or other hazardous conditions. The piezometer monitoring wells are dry.



Daniel Thomas Hurst Date: 9-25-98

Cyprus Plateau Mining Corporation
Quarterly Refuse Pile Certification
Fourth Quarter 1998

I hereby certify that I am a registered professional engineer in the State of Utah. I certify that I have made an inspection of the coal processing refuse pile at Cyprus Plateau Mining Corporations' Willow Creek Mine in Carbon County Utah. The refuse pile has been constructed and maintained as designed. There are no apparent areas of instability, structural weakness or other hazardous conditions. The piezometer monitoring wells are dry.

Dan W. Guy P.E.

Date: 12/28/98

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 requirements of R645-301-130 and R645-301-140.

CONTENTS

SUBSIDENCE MONITORING REPORT
1998
WILLOW CREEK MINE
ACT/007/006

CYPRUS PLATEAU MINING CORPORATION
Willow Creek Mine
Price, Utah

Prepared By:

EARTHFAX ENGINEERING, INC.
Midvale, Utah

May 11, 1999

SUBSIDENCE MONITORING REPORT
1998
WILLOW CREEK MINE
ACT/007/006

INTRODUCTION

The Willow Creek Mine is owned and operated by Cyprus Plateau Mining Corporation ("CPMC"). Located approximately 10 miles north of Helper, Utah, the mine is at the extreme northwest end of the Book Cliffs Coal Field. Mining commenced in the fall of 1996 with continuous mining equipment to develop accessways ("entries") to the proposed longwall panels. Longwall mining began in mid-1998.

This report presents the results of the 1998 subsidence monitoring. These data are presented in accordance with the subsidence monitoring plan found in the Willow Creek Mining and Reclamation Plan, Volume 3, Section 4.5.2.2.

1998 MONITORING

Subsidence monitoring in 1998 consisted of collecting elevation data using GPS equipment, for those portions of the property with active mining, from the monitoring network monuments established in 1997. The subsidence monitoring network is based on six control points on the Utah State Plane Coordinate System and the NAD 1927 sea level datum. From these six points, an additional 158 monitoring points were established in 1997. Map 1 presents the location of the monitoring points. These monitoring points were established in the field by driving reinforcing rods into the ground to a depth of 3 feet and installing an aluminum cap on top of the rod, with the point number stamped into the cap.

For those sections of the mine with active mining, the monuments set in 1997 were surveyed in December 1998 and elevations were determined using Global Positioning

methods. These values are tabulated in Table 1. The 1998 data are presented in Table 1 as shaded numbers. The other data are 1997 values based on the assumption that the areas outside of the active mining areas would not change. Table 2 presents the baseline data collected in 1997. Subsidence values were determined by subtracting the 1998 elevations from the 1997 values.

The monitoring network consists of four general sections. Sections A and C were not located within active mining areas and were not resurveyed in 1998. Sections B and BC had points that were located within the active mining areas. The points that were read in 1998 are presented on Map 1 as solid symbols, while the baseline points that were not resurveyed in 1998 are open. Also, Map 1 presents the extent of mining activities through 1998.

Several anomalous values were identified. Stations B-5, B-20, B-21, B-38, B-41, and BC-13 were reported with either locations or elevations that were not consistent with the prior values. B-20 and B-21 are new sites to replace missing monuments. Data obtained from stations B-5, B-38, B-41, and BC-13 are thought to be the result of problems in the interpretation of GPS signals. While these values were presented in Table 1, they were not used in the preparation of the cross-section figures.

Section profiles were prepared to compare the 1998 elevations against the 1997 values. Figures 1 and 2 present the profiles for sections B and BC, respectively.

Based on the data tabulation and the sections, the subsidence data indicates that no significant subsidence has occurred associated with the Willow Creek Mine. While some indications of subsidence are possible, these readings are thought to be the result of variations of the GPS readings. All of the subsidence readings are less than the accuracy of the GPS instrument. Therefore, they may not be indicative of actual subsidence conditions.

Table 1

1998 Willow Creek Mine Subsidence Monitoring Data

Point No.	1998 Data Set*			Subsidence From Last Year	Difference In Northing From Last Year	Difference In Easting From Last Year	Horizontal Distance Along Section	Accumulated Distance Along Section
	Northing	Easting	Elevation					
SS-CON-1	522,620.59	2,178,659.27	8,454.68					
MAT	535,667.74	2,181,889.15	7,454.05					
GENE	523,471.08	2,191,540.98	8,270.31					
EAST	510,457.12	2,183,503.59	6,404.55					
BC-1	510,968.15	2,176,438.10	6,164.78					
BARN	510,795.10	2,177,679.20	6,266.66					
CPSS-A1	522,745.86	2,187,566.89	8,197.40				-	0.00
CPSS-A2	521,671.73	2,187,569.75	8,193.80				1,074.13	1,074.13
CPSS-A3	520,768.74	2,187,896.03	8,066.11				960.13	2,034.26
CPSS-A4	519,860.97	2,187,988.46	7,912.53				912.46	2,946.73
CPSS-A5	519,011.36	2,187,610.47	7,916.46				929.90	3,876.63
CPSS-A6	517,930.91	2,187,299.45	7,612.88				1,124.32	5,000.95
CPSS-B1	522,746.92	2,183,319.13	8,436.73				-	0.00
CPSS-B2	522,159.327	2,183,398.543	8,405.399	(0.07)	(0.10)	(0.02)	592.94	592.94
CPSS-B3	521,608.901	2,183,159.357	8,333.547	(0.12)	(0.17)	(0.04)	600.15	1,193.08
CPSS-B4	521,162.961	2,182,945.990	8,311.756	(0.10)	(0.07)	(0.11)	494.36	1,687.44
CPSS-B5	517,081.700	2,181,947.550	8,031.560	(210.31)	(3,894.23)	(1,057.68)	196.19	1,883.63
CPSS-B6	520,793.759	2,183,045.192	8,173.110	(0.04)	(0.13)	(0.07)	186.50	2,070.13
CPSS-B7	520,576.113	2,183,093.019	8,155.902	(0.04)	(0.18)	0.01	222.84	2,292.97
CPSS-B8	520,393.013	2,183,067.869	8,138.505	(0.02)	(0.18)	0.03	184.82	2,477.79
CPSS-B9	520,193.457	2,183,013.833	8,141.462	(0.05)	(0.13)	0.02	206.74	2,684.53
CPSS-B10	520,106.179	2,182,977.447	8,150.494	(0.07)	(0.16)	0.03	94.56	2,779.09
CPSS-B11	520,016.609	2,182,929.877	8,149.238	(0.08)	(0.13)	(0.01)	101.42	2,880.51
CPSS-B12	519,919.205	2,182,896.030	8,127.282	(0.07)	(0.13)	(0.01)	103.12	2,983.63
CPSS-B13	519,838.824	2,182,833.922	8,130.861	(0.18)	(0.10)	(0.01)	101.58	3,085.21
CPSS-B14	519,743.001	2,182,808.539	8,113.062	(0.06)	(0.12)	0.03	99.13	3,184.33
CPSS-B15	519,652.495	2,182,779.764	8,099.644	0.00	(0.22)	0.00	94.97	3,279.30
CPSS-B16	519,554.472	2,182,757.590	8,082.136	0.12	(0.25)	(0.03)	100.50	3,379.80
CPSS-B17	519,458.653	2,182,686.735	8,075.216	(0.05)	(0.21)	0.00	119.17	3,498.98
CPSS-B18	519,348.113	2,182,661.698	8,065.733	(0.14)	(0.20)	0.08	113.34	3,612.32
CPSS-B19	519,244.260	2,182,643.437	8,066.276	(0.09)	(0.24)	0.07	105.45	3,717.76
CPSS-B20	519,184.805	2,182,647.636	8,069.883	1.56	24.89	1.11	59.60	3,777.36
CPSS-B21	519,084.464	2,182,649.740	8,073.551	(1.86)	15.52	(32.08)	100.36	3,877.73
CPSS-B22	518,979.618	2,182,676.467	8,088.177	(0.13)	(0.12)	(0.04)	108.20	3,985.93
CPSS-B23	518,872.758	2,182,691.869	8,094.306	(0.39)	(0.22)	0.12	107.96	4,093.89
CPSS-B24	518,770.520	2,182,690.520	8,118.070	(0.08)	(0.10)	0.03	102.25	4,196.14
CPSS-B25	518,642.920	2,182,708.880	8,147.730	(0.08)	(0.08)	(0.02)	128.91	4,325.05
CPSS-B26	518,558.133	2,182,713.216	8,161.236	(0.28)	(0.23)	0.00	84.90	4,409.95
CPSS-B27	518,487.487	2,182,763.542	8,165.854	(0.10)	(0.19)	0.03	86.74	4,496.69
CPSS-B28	518,390.270	2,182,799.850	8,174.680	(0.03)	(0.20)	0.14	103.78	4,600.46
CPSS-B29	518,278.247	2,182,835.877	8,182.940	(0.06)	(0.20)	0.14	117.67	4,718.14
CPSS-B30	518,087.175	2,182,878.195	8,181.946	(0.05)	(0.24)	0.02	195.70	4,913.84
CPSS-B31	517,962.373	2,182,752.678	8,139.137	(0.08)	(0.17)	(0.14)	177.00	5,090.84
CPSS-B32	517,779.871	2,182,683.272	8,120.350	(0.07)	(0.15)	(0.13)	195.25	5,286.10
CPSS-B33	517,608.386	2,182,587.463	8,119.348	(0.02)	(0.07)	(0.05)	196.43	5,482.53
CPSS-B34	517,440.351	2,182,472.806	8,120.694	0.01	(0.04)	0.00	203.43	5,685.96
CPSS-B35	517,243.540	2,182,385.820	8,130.640	0.00	0.00	0.00	215.18	5,901.13
CPSS-B36	517,096.290	2,182,271.110	8,165.400	0.01	0.02	0.00	186.66	6,087.79
CPSS-B37	516,895.540	2,182,190.060	8,170.180	(0.01)	(0.02)	0.01	216.49	6,304.29
CPSS-B38	516,832.611	2,182,121.592	8,176.355	0.37	137.86	(49.06)	92.99	6,397.28
CPSS-B39	516,515.350	2,182,157.240	8,160.030	(0.16)	(0.21)	(0.17)	319.26	6,716.54
CPSS-B40	516,426.200	2,182,131.220	8,142.500	(0.12)	(0.15)	(0.10)	92.87	6,809.41
CPSS-B41	516,330.400	2,182,107.550	8,142.740		(0.04)	(0.03)	98.68	6,908.09
CPSS-B42	516,216.070	2,182,097.740	8,113.900	(0.03)	(0.03)	(0.03)	114.75	7,022.84
CPSS-B43	516,134.870	2,182,099.260	8,116.040	(0.05)	(0.03)	(0.06)	81.21	7,104.05
CPSS-B44	516,036.080	2,182,101.290	8,120.700	(0.02)	(0.11)	(0.04)	98.81	7,202.86
CPSS-B45	515,928.070	2,182,127.500	8,128.380	(0.03)	(0.07)	(0.04)	111.14	7,314.01
CPSS-B46	515,838.170	2,182,141.400	8,141.750	(0.13)	(0.04)	(0.07)	90.97	7,404.98
CPSS-B47	515,728.140	2,182,184.710	8,163.640	(0.02)	(0.06)	(0.09)	118.25	7,523.22
CPSS-B48	515,647.400	2,182,171.280	8,144.080	(0.07)	(0.03)	(0.04)	81.85	7,605.07

* Shaded values were read in December 1998. Other values are 1997 values.

Table 1

1998 Willow Creek Mine Subsidence Monitoring Data

Point No.	1998 Data Set*			Subsidence From Last Year	Difference In Northing From Last Year	Difference In Easting From Last Year	Horizontal Distance Along Section	Accumulated Distance Along Section
	Northing	Easting	Elevation					
CPSS-B49	515,533.220	2,182,160.800	8,150.600	(0.05)	(0.08)	(0.05)	114.66	7,719.73
CPSS-B50	515,451.190	2,182,129.550	8,154.310	(0.04)	(0.03)	(0.02)	87.78	7,807.51
CPSS-B51	515,387.79	2,182,047.28	8,159.28				103.86	7,911.38
CPSS-B52	515,329.12	2,181,969.90	8,153.27				97.11	8,008.48
CPSS-B53	515,229.58	2,181,931.85	8,113.66				106.56	8,115.05
CPSS-B54	515,154.24	2,181,909.79	8,084.73				78.50	8,193.55
CPSS-B55	515,055.67	2,181,915.75	8,049.67				98.75	8,292.30
CPSS-B56	514,951.17	2,181,895.69	8,024.18				106.41	8,398.71
CPSS-B57	514,863.31	2,181,846.10	8,011.35				100.89	8,499.60
CPSS-B58	514,793.73	2,181,821.30	7,995.47				73.87	8,573.47
CPSS-B59	514,679.96	2,181,769.76	7,959.38				124.90	8,698.37
CPSS-B60	514,605.34	2,181,721.61	7,925.85				88.81	8,787.17
CPSS-B61	514,514.83	2,181,694.47	7,871.72				94.49	8,881.66
CPSS-B62	514,424.47	2,181,654.82	7,870.80				98.68	8,980.34
CPSS-B63	514,332.30	2,181,640.82	7,823.30				93.23	9,073.57
CPSS-B64	514,143.02	2,181,610.85	7,809.02				191.64	9,265.21
CPSS-B65	513,938.02	2,181,559.09	7,757.54				211.43	9,476.64
CPSS-B66	513,777.42	2,181,459.09	7,761.96				189.19	9,665.83
CPSS-B67	513,599.48	2,181,389.34	7,742.48				191.12	9,856.95
CPSS-BA1	517,742.200	2,183,424.600	7,948.080	(0.08)	(0.05)	(0.10)	-	-
CPSS-BA2	517,469.100	2,183,680.120	7,864.880	(0.04)	(0.08)	(0.07)	374.00	374.00
CPSS-BA3	517,261.680	2,184,339.000	7,773.400	(0.05)	(0.04)	(0.10)	690.76	1,064.75
CPSS-BB1	515,376.24	2,182,172.64	8,127.61				-	-
CPSS-BB2	514,561.22	2,183,158.51	7,860.68				1,279.14	1,279.14
CPSS-BC1	516,770.52	2,182,159.96	8,184.03				-	-
CPSS-BC2	516,827.684	2,182,071.540	8,161.558	(0.06)	(0.04)	0.04	105.29	105.29
CPSS-BC3	516,909.07	2,182,034.90	8,113.13				89.25	194.54
CPSS-BC4	516,983.12	2,181,975.52	8,072.21				94.92	289.46
CPSS-BC5	517,081.70	2,181,947.55	8,031.56				102.47	391.93
CPSS-BC6	517,152.39	2,181,883.81	7,997.15				95.18	487.11
CPSS-BC7	517,225.09	2,181,866.02	7,963.27				74.85	561.96
CPSS-BC8	517,305.17	2,181,777.09	7,907.35				119.67	681.63
CPSS-BC9	517,370.98	2,181,731.41	7,881.65				80.11	761.74
CPSS-BC10	517,422.49	2,181,630.03	7,820.10				113.72	875.46
CPSS-BC11	517,504.11	2,181,571.76	7,785.26				100.29	975.74
CPSS-BC12	517,577.67	2,181,507.80	7,763.65				97.48	1,073.22
CPSS-BC13	517,649.600	2,181,446.514	7,749.780	4.27	(3.92)	2.49	94.50	1,167.72
CPSS-BC14	517,735.14	2,181,375.18	7,727.34				111.38	1,279.10
CPSS-BC15	517,799.76	2,181,317.63	7,698.37				86.53	1,365.63
CPSS-BC16	517,896.97	2,181,247.92	7,654.49				119.62	1,485.25
CPSS-BC17	517,958.68	2,181,206.38	7,617.70				74.39	1,559.64
CPSS-BC18	518,036.90	2,181,125.80	7,591.81				112.30	1,671.94
CPSS-BC19	518,080.98	2,181,056.88	7,572.01				81.81	1,753.75
CPSS-BC20	518,125.041	2,180,977.791	7,547.656	(0.08)	(3.74)	(0.63)	90.53	1,844.29
CPSS-BC21	518,143.08	2,180,825.18	7,491.15				153.67	1,997.96
CPSS-BC22	518,208.567	2,180,769.972	7,418.909	(0.17)	(0.08)	0.04	85.65	2,083.61
CPSS-BC23	518,272.067	2,180,701.862	7,361.556	(0.15)	(0.07)	(0.01)	93.12	2,176.73
CPSS-BC24	518,365.85	2,180,637.47	7,314.95				113.76	2,290.49
CPSS-C1	512,938.57	2,177,940.73	6,285.47				-	-
CPSS-C2	513,041.29	2,177,983.90	6,289.67				111.42	111.42
CPSS-C3	513,125.82	2,178,036.86	6,303.85				99.75	211.17
CPSS-C4	513,191.42	2,178,090.36	6,310.41				84.65	295.82
CPSS-C5	513,305.34	2,178,126.29	6,327.47				119.45	415.27
CPSS-C6	513,367.03	2,178,147.59	6,336.01				65.26	480.54
CPSS-C7	513,471.77	2,178,210.70	6,324.86				122.28	602.82
CPSS-C8	513,563.30	2,178,239.97	6,333.04				96.10	698.92
CPSS-C9	513,629.57	2,178,330.54	6,338.72				112.23	811.14
CPSS-C10	513,751.84	2,178,381.02	6,350.18				132.28	943.42
CPSS-C11	513,841.80	2,178,346.77	6,349.55				96.26	1,039.68
CPSS-C12	513,941.89	2,178,395.60	6,353.91				111.37	1,151.05

* Shaded values were read in December 1998. Other values are 1997 values.

Table 1

1998 Willow Creek Mine Subsidence Monitoring Data

Point No.	1998 Data Set*			Subsidence From Last Year	Difference In Northing From Last Year	Difference In Easting From Last Year	Horizontal Distance Along Section	Accumulated Distance Along Section
	Northing	Easting	Elevation					
CPSS-C13	514,029.11	2,178,339.10	6,370.76				103.92	1,254.97
CPSS-C14	514,116.46	2,178,463.79	6,387.41				152.24	1,407.21
CPSS-C15	514,248.17	2,178,393.05	6,370.04				149.50	1,556.72
CPSS-C16	514,315.87	2,178,358.85	6,375.13				75.85	1,632.57
CPSS-C17	514,396.37	2,178,293.36	6,396.86				103.77	1,736.34
CPSS-C18	514,490.99	2,178,255.39	6,399.80				101.95	1,838.29
CPSS-C19	514,710.47	2,178,250.48	6,424.25				219.53	2,057.83
CPSS-C20	514,872.11	2,178,280.61	6,420.51				164.42	2,222.25
CPSS-C21	515,100.60	2,178,308.09	6,461.67				230.14	2,452.39
CPSS-C22	515,262.10	2,178,286.25	6,455.81				162.97	2,615.36
CPSS-C23	515,447.90	2,178,306.46	6,475.56				186.90	2,802.26
CPSS-C24	515,643.53	2,178,268.94	6,483.13				199.20	3,001.45
CPSS-C25	515,859.17	2,178,297.78	6,512.82				217.56	3,219.01
CPSS-C26	515,995.70	2,178,423.16	6,519.89				185.37	3,404.38
CPSS-C27	516,205.96	2,178,540.98	6,538.93				241.02	3,645.40
CPSS-C28	516,393.77	2,178,566.14	6,553.64				189.49	3,834.89
CPSS-C29	516,599.37	2,178,651.09	6,580.62				222.46	4,057.35
CPSS-C30	516,651.40	2,178,799.44	6,596.78				157.21	4,214.55
CPSS-C31	516,756.69	2,178,782.88	6,574.39				106.58	4,321.14
CPSS-C32	516,818.45	2,178,778.67	6,579.77				61.90	4,383.04
CPSS-C33	516,878.58	2,178,865.19	6,625.05				105.36	4,488.41
CPSS-C34	516,968.52	2,178,909.54	6,626.10				100.28	4,588.69
CPSS-C35	517,104.90	2,178,915.54	6,626.92				136.51	4,725.20
CPSS-C36	517,183.81	2,178,974.21	6,636.39				98.33	4,823.53
CPSS-C37	517,246.97	2,179,026.80	6,637.36				82.19	4,905.72
CPSS-C38	517,319.03	2,179,088.06	6,659.84				94.58	5,000.30
CPSS-C39	517,445.06	2,179,095.08	6,672.66				126.23	5,126.52
CPSS-C40	517,556.28	2,179,095.55	6,674.98				111.22	5,237.74
CPSS-C41	517,642.35	2,179,152.34	6,675.69				103.12	5,340.86
CPSS-C42	517,713.40	2,179,125.98	6,691.45				75.78	5,416.64
CPSS-C43	517,789.04	2,179,188.84	6,700.90				98.35	5,514.99
CPSS-C44	517,888.31	2,179,220.33	6,715.09				104.14	5,619.14
CPSS-C45	517,987.19	2,179,250.51	6,726.46				103.38	5,722.52
CPSS-C46	518,121.30	2,179,215.39	6,729.80				138.63	5,861.15
CPSS-C47	518,179.88	2,179,221.39	6,742.32				58.89	5,920.04
CPSS-C48	518,307.24	2,179,297.24	6,751.54				148.24	6,068.28
CPSS-C49	518,420.34	2,179,217.38	6,780.50				138.45	6,206.73
CPSS-C50	518,483.99	2,179,359.70	6,790.03				155.90	6,362.63
CPSS-C51	518,602.71	2,179,371.95	6,790.20				119.35	6,481.98
CPSS-C52	518,689.26	2,179,409.28	6,810.51				94.26	6,576.24
CPSS-C53	518,744.45	2,179,509.36	6,817.79				114.29	6,690.53
CPSS-C54	518,849.78	2,179,559.70	6,835.59				116.74	6,807.27
CPSS-C55	518,942.98	2,179,515.97	6,846.68				102.95	6,910.22
CPSS-C56	519,094.28	2,179,658.65	6,869.91				207.96	7,118.18

* Shaded values were read in December 1998. Other values are 1997 values.

Table 2

1997 Willow Creek Mine Subsidence Monitoring Data

Point No.	1997 Data Set						Horizontal Distance	Accumulated Distance
	Northing	Easting	Elevation					
SS-CON-1	522,620.59	2,178,659.27	8,454.68					
MAT	535,667.74	2,181,889.15	7,454.05					
GENE	523,471.08	2,191,540.98	8,270.31					
EAST	510,457.12	2,183,503.59	6,404.55					
BC-1	510,968.15	2,176,438.10	6,164.78					
BARN	510,795.10	2,177,679.20	6,266.66					
CPSS-A1	522,745.86	2,187,566.89	8,197.40				-	-
CPSS-A2	521,671.73	2,187,569.75	8,193.80				1,074.13	1,074.13
CPSS-A3	520,768.74	2,187,896.03	8,066.11				960.13	2,034.26
CPSS-A4	519,860.97	2,187,988.46	7,912.53				912.46	2,946.73
CPSS-A5	519,011.36	2,187,610.47	7,916.46				929.90	3,876.63
CPSS-A6	517,930.91	2,187,299.45	7,612.88				1,124.32	5,000.95
CPSS-B1	522,746.92	2,183,319.13	8,436.73				-	-
CPSS-B2	522,159.43	2,183,398.56	8,405.47				592.84	592.84
CPSS-B3	521,609.07	2,183,159.40	8,333.67				600.08	1,192.91
CPSS-B4	521,163.03	2,182,946.10	8,311.86				494.42	1,687.33
CPSS-B5	520,975.93	2,183,005.23	8,241.87				196.22	1,883.55
CPSS-B6	520,793.89	2,183,045.26	8,173.15				186.39	2,069.94
CPSS-B7	520,576.29	2,183,093.01	8,155.94				222.78	2,292.72
CPSS-B8	520,393.19	2,183,067.84	8,138.52				184.82	2,477.54
CPSS-B9	520,193.59	2,183,013.81	8,141.51				206.78	2,684.32
CPSS-B10	520,106.34	2,182,977.42	8,150.56				94.53	2,778.86
CPSS-B11	520,016.74	2,182,929.89	8,149.32				101.43	2,880.28
CPSS-B12	519,919.33	2,182,896.04	8,127.35				103.12	2,983.41
CPSS-B13	519,838.92	2,182,833.93	8,131.04				101.60	3,085.01
CPSS-B14	519,743.12	2,182,808.51	8,113.12				99.12	3,184.13
CPSS-B15	519,652.71	2,182,779.76	8,099.64				94.87	3,279.00
CPSS-B16	519,554.72	2,182,757.62	8,082.02				100.46	3,379.46
CPSS-B17	519,458.86	2,182,686.73	8,075.27				119.22	3,498.68
CPSS-B18	519,348.31	2,182,661.62	8,065.87				113.37	3,612.05
CPSS-B19	519,244.50	2,182,643.37	8,066.37				105.40	3,717.45
CPSS-B20	519,159.92	2,182,646.53	8,068.32				84.64	3,802.09
CPSS-B21	519,068.94	2,182,681.82	8,075.41				97.58	3,899.68
CPSS-B22	518,979.74	2,182,676.51	8,088.31				89.36	3,989.03
CPSS-B23	518,872.98	2,182,691.75	8,094.70				107.84	4,096.88
CPSS-B24	518,770.62	2,182,690.49	8,118.15				102.37	4,199.24
CPSS-B25	518,643.00	2,182,708.90	8,147.81				128.94	4,328.18
CPSS-B26	518,558.36	2,182,713.22	8,161.52				84.75	4,412.93
CPSS-B27	518,487.68	2,182,763.51	8,165.95				86.75	4,499.68
CPSS-B28	518,390.47	2,182,799.71	8,174.71				103.73	4,603.41
CPSS-B29	518,278.45	2,182,835.74	8,183.00				117.67	4,721.08
CPSS-B30	518,087.41	2,182,878.18	8,182.00				195.70	4,916.78
CPSS-B31	517,962.54	2,182,752.82	8,139.22				176.94	5,093.72
CPSS-B32	517,780.02	2,182,683.40	8,120.42				195.28	5,289.00
CPSS-B33	517,608.46	2,182,587.51	8,119.37				196.54	5,485.54
CPSS-B34	517,440.39	2,182,472.81	8,120.68				203.48	5,689.01
CPSS-B35	517,243.54	2,182,385.82	8,130.64				215.21	5,904.23
CPSS-B36	517,096.27	2,182,271.11	8,165.39				186.67	6,090.90
CPSS-B37	516,895.56	2,182,190.05	8,170.19				216.46	6,307.36
CPSS-B38	516,694.75	2,182,170.65	8,175.99				201.74	6,509.11
CPSS-B39	516,515.56	2,182,157.41	8,160.19				179.68	6,688.79
CPSS-B40	516,426.35	2,182,131.32	8,142.62				92.95	6,781.73
CPSS-B41	516,330.44	2,182,107.58	8,124.84				98.80	6,880.54
CPSS-B42	516,216.10	2,182,097.77	8,113.93				114.76	6,995.30
CPSS-B43	516,134.90	2,182,099.32	8,116.09				81.21	7,076.51
CPSS-B44	516,036.19	2,182,101.33	8,120.72				98.73	7,175.24

Table 2

1997 Willow Creek Mine Subsidence Monitoring Data

Point No.	1997 Data Set						Horizontal Distance	Accumulated Distance
	Northing	Easting	Elevation					
CPSS-B45	515,928.14	2,182,127.54	8,128.41				111.18	7,286.43
CPSS-B46	515,838.21	2,182,141.47	8,141.88				91.00	7,377.43
CPSS-B47	515,728.20	2,182,184.80	8,163.66				118.24	7,495.66
CPSS-B48	515,647.43	2,182,171.32	8,144.15				81.89	7,577.55
CPSS-B49	515,533.30	2,182,160.85	8,150.65				114.61	7,692.16
CPSS-B50	515,451.22	2,182,129.57	8,154.35				87.84	7,780.00
CPSS-B51	515,387.79	2,182,047.28	8,159.28				103.90	7,883.90
CPSS-B52	515,329.12	2,181,969.90	8,153.27				97.11	7,981.00
CPSS-B53	515,229.58	2,181,931.85	8,113.66				106.56	8,087.57
CPSS-B54	515,154.24	2,181,909.79	8,084.73				78.50	8,166.07
CPSS-B55	515,055.67	2,181,915.75	8,049.67				98.75	8,264.82
CPSS-B56	514,951.17	2,181,895.69	8,024.18				106.41	8,371.23
CPSS-B57	514,863.31	2,181,846.10	8,011.35				100.89	8,472.12
CPSS-B58	514,793.73	2,181,821.30	7,995.47				73.87	8,545.99
CPSS-B59	514,679.96	2,181,769.76	7,959.38				124.90	8,670.89
CPSS-B60	514,605.34	2,181,721.61	7,925.85				88.81	8,759.69
CPSS-B61	514,514.83	2,181,694.47	7,871.72				94.49	8,854.18
CPSS-B62	514,424.47	2,181,654.82	7,870.80				98.68	8,952.86
CPSS-B63	514,332.30	2,181,640.82	7,823.30				93.23	9,046.09
CPSS-B64	514,143.02	2,181,610.85	7,809.02				191.64	9,237.73
CPSS-B65	513,938.02	2,181,559.09	7,757.54				211.43	9,449.16
CPSS-B66	513,777.42	2,181,459.09	7,761.96				189.19	9,638.35
CPSS-B67	513,599.48	2,181,389.34	7,742.48				191.12	9,829.47
CPSS-BA1	517,742.25	2,183,424.70	7,948.16				-	-
CPSS-BA2	517,469.18	2,183,680.19	7,864.92				373.96	373.96
CPSS-BA3	517,261.72	2,184,339.10	7,773.45				690.80	1,064.75
CPSS-BB1	515,376.24	2,182,172.64	8,127.61				-	-
CPSS-BB2	514,561.22	2,183,158.51	7,860.68				1,279.14	1,279.14
CPSS-BC1	516,770.52	2,182,159.96	8,184.03				-	-
CPSS-BC2	516,827.72	2,182,071.50	8,161.62				105.34	105.34
CPSS-BC3	516,909.07	2,182,034.90	8,113.13				89.20	194.55
CPSS-BC4	516,983.12	2,181,975.52	8,072.21				94.92	289.46
CPSS-BC5	517,081.70	2,181,947.55	8,031.56				102.47	391.94
CPSS-BC6	517,152.39	2,181,883.81	7,997.15				95.18	487.12
CPSS-BC7	517,225.09	2,181,866.02	7,963.27				74.85	561.96
CPSS-BC8	517,305.17	2,181,777.09	7,907.35				119.67	681.64
CPSS-BC9	517,370.98	2,181,731.41	7,881.65				80.11	761.75
CPSS-BC10	517,422.49	2,181,630.03	7,820.10				113.72	875.46
CPSS-BC11	517,504.11	2,181,571.76	7,785.26				100.29	975.75
CPSS-BC12	517,577.67	2,181,507.80	7,763.65				97.48	1,073.22
CPSS-BC13	517,653.52	2,181,444.02	7,745.51				99.10	1,172.33
CPSS-BC14	517,735.14	2,181,375.18	7,727.34				106.77	1,279.10
CPSS-BC15	517,799.76	2,181,317.63	7,698.37				86.53	1,365.63
CPSS-BC16	517,896.97	2,181,247.92	7,654.49				119.62	1,485.25
CPSS-BC17	517,958.68	2,181,206.38	7,617.70				74.39	1,559.64
CPSS-BC18	518,036.90	2,181,125.80	7,591.81				112.30	1,671.94
CPSS-BC19	518,080.98	2,181,056.88	7,572.01				81.81	1,753.75
CPSS-BC20	518,128.78	2,180,978.42	7,547.74				91.87	1,845.63
CPSS-BC21	518,143.08	2,180,825.18	7,491.15				153.91	1,999.53
CPSS-BC22	518,208.65	2,180,769.93	7,419.08				85.74	2,085.28
CPSS-BC23	518,272.14	2,180,701.87	7,361.71				93.08	2,178.35
CPSS-BC24	518,365.85	2,180,637.47	7,314.95				113.71	2,292.06
CPSS-C1	512,938.57	2,177,940.73	6,285.47				-	-
CPSS-C2	513,041.29	2,177,983.90	6,289.67				111.42	111.42
CPSS-C3	513,125.82	2,178,036.86	6,303.85				99.75	211.17
CPSS-C4	513,191.42	2,178,090.36	6,310.41				84.65	295.82
CPSS-C5	513,305.34	2,178,126.29	6,327.47				119.45	415.27
CPSS-C6	513,367.03	2,178,147.59	6,336.01				65.26	480.54
CPSS-C7	513,471.77	2,178,210.70	6,324.86				122.28	602.82
CPSS-C8	513,563.30	2,178,239.97	6,333.04				96.10	698.92

Table 2

1997 Willow Creek Mine Subsidence Monitoring Data

Point No.	1997 Data Set						Horizontal Distance	Accumulated Distance
	Northing	Easting	Elevation					
CPSS-C9	513,629.57	2,178,330.54	6,338.72				112.23	811.14
CPSS-C10	513,751.84	2,178,381.02	6,350.18				132.28	943.42
CPSS-C11	513,841.80	2,178,346.77	6,349.55				96.26	1,039.68
CPSS-C12	513,941.89	2,178,395.60	6,353.91				111.37	1,151.05
CPSS-C13	514,029.11	2,178,339.10	6,370.76				103.92	1,254.97
CPSS-C14	514,116.46	2,178,463.79	6,387.41				152.24	1,407.21
CPSS-C15	514,248.17	2,178,393.05	6,370.04				149.50	1,556.72
CPSS-C16	514,315.87	2,178,358.85	6,375.13				75.85	1,632.57
CPSS-C17	514,396.37	2,178,293.36	6,396.86				103.77	1,736.34
CPSS-C18	514,490.99	2,178,255.39	6,399.80				101.95	1,838.29
CPSS-C19	514,710.47	2,178,250.48	6,424.25				219.53	2,057.83
CPSS-C20	514,872.11	2,178,280.61	6,420.51				164.42	2,222.25
CPSS-C21	515,100.60	2,178,308.09	6,461.67				230.14	2,452.39
CPSS-C22	515,262.10	2,178,286.25	6,455.81				162.97	2,615.36
CPSS-C23	515,447.90	2,178,306.46	6,475.56				186.90	2,802.26
CPSS-C24	515,643.53	2,178,268.94	6,483.13				199.20	3,001.45
CPSS-C25	515,859.17	2,178,297.78	6,512.82				217.56	3,219.01
CPSS-C26	515,995.70	2,178,423.16	6,519.89				185.37	3,404.38
CPSS-C27	516,205.96	2,178,540.98	6,538.93				241.02	3,645.40
CPSS-C28	516,393.77	2,178,566.14	6,553.64				189.49	3,834.89
CPSS-C29	516,599.37	2,178,651.09	6,580.62				222.46	4,057.35
CPSS-C30	516,651.40	2,178,799.44	6,596.78				157.21	4,214.55
CPSS-C31	516,756.69	2,178,782.88	6,574.39				106.58	4,321.14
CPSS-C32	516,818.45	2,178,778.67	6,579.77				61.90	4,383.04
CPSS-C33	516,878.58	2,178,865.19	6,625.05				105.36	4,488.41
CPSS-C34	516,968.52	2,178,909.54	6,626.10				100.28	4,588.69
CPSS-C35	517,104.90	2,178,915.54	6,626.92				136.51	4,725.20
CPSS-C36	517,183.81	2,178,974.21	6,636.39				98.33	4,823.53
CPSS-C37	517,246.97	2,179,026.80	6,637.36				82.19	4,905.72
CPSS-C38	517,319.03	2,179,088.06	6,659.84				94.58	5,000.30
CPSS-C39	517,445.06	2,179,095.08	6,672.66				126.23	5,126.52
CPSS-C40	517,556.28	2,179,095.55	6,674.98				111.22	5,237.74
CPSS-C41	517,642.35	2,179,152.34	6,675.69				103.12	5,340.86
CPSS-C42	517,713.40	2,179,125.98	6,691.45				75.78	5,416.64
CPSS-C43	517,789.04	2,179,188.84	6,700.90				98.35	5,514.99
CPSS-C44	517,888.31	2,179,220.33	6,715.09				104.14	5,619.14
CPSS-C45	517,987.19	2,179,250.51	6,726.46				103.38	5,722.52
CPSS-C46	518,121.30	2,179,215.39	6,729.80				138.63	5,861.15
CPSS-C47	518,179.88	2,179,221.39	6,742.32				58.89	5,920.04
CPSS-C48	518,307.24	2,179,297.24	6,751.54				148.24	6,068.28
CPSS-C49	518,420.34	2,179,217.38	6,780.50				138.45	6,206.73
CPSS-C50	518,483.99	2,179,359.70	6,790.03				155.90	6,362.63
CPSS-C51	518,602.71	2,179,371.95	6,790.20				119.35	6,481.98
CPSS-C52	518,689.26	2,179,409.28	6,810.51				94.26	6,576.24
CPSS-C53	518,744.45	2,179,509.36	6,817.79				114.29	6,690.53
CPSS-C54	518,849.78	2,179,559.70	6,835.59				116.74	6,807.27
CPSS-C55	518,942.98	2,179,515.97	6,846.68				102.95	6,910.22
CPSS-C56	519,094.28	2,179,658.65	6,869.91				207.96	7,118.18

FIGURE 1
SECTION B

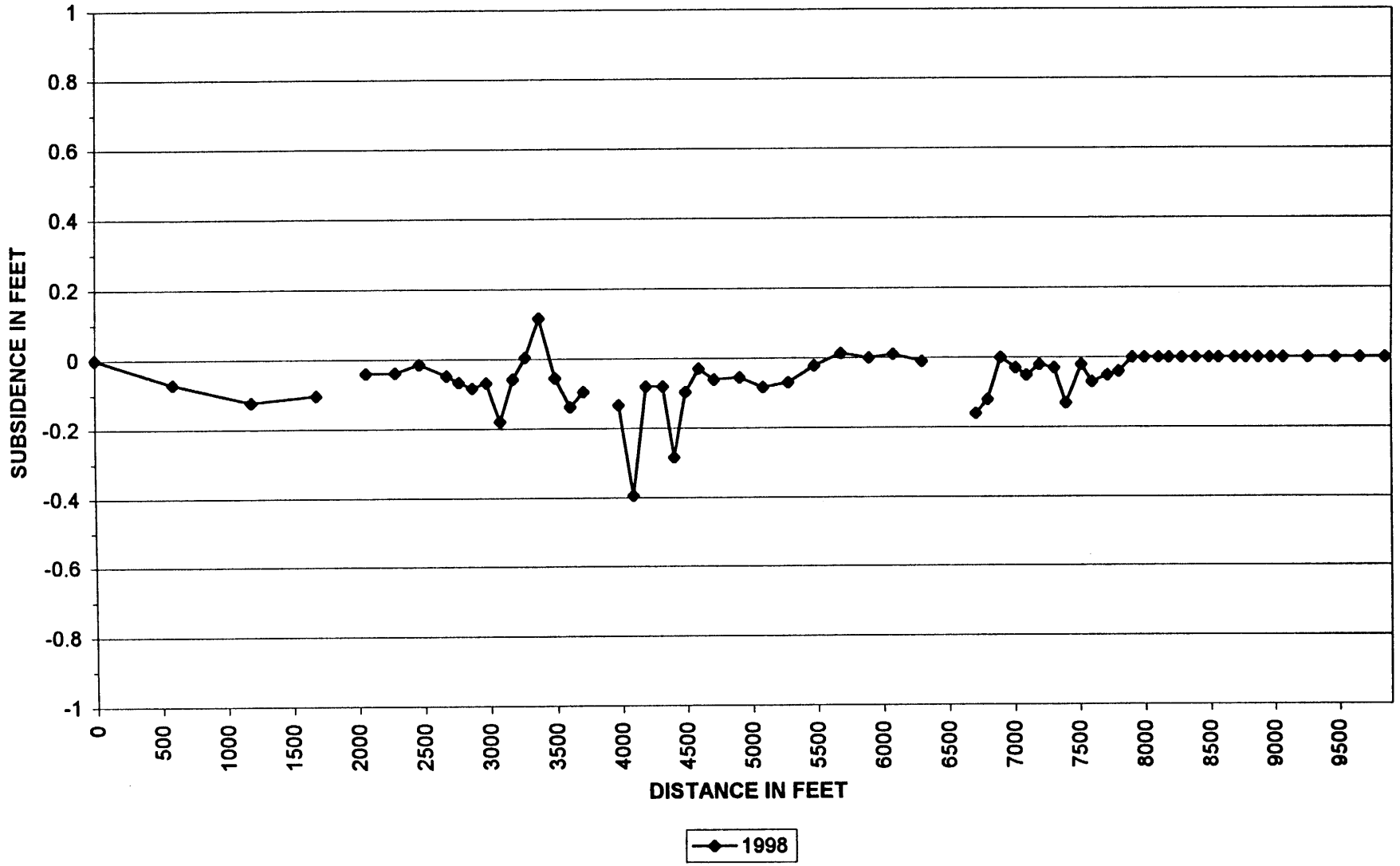
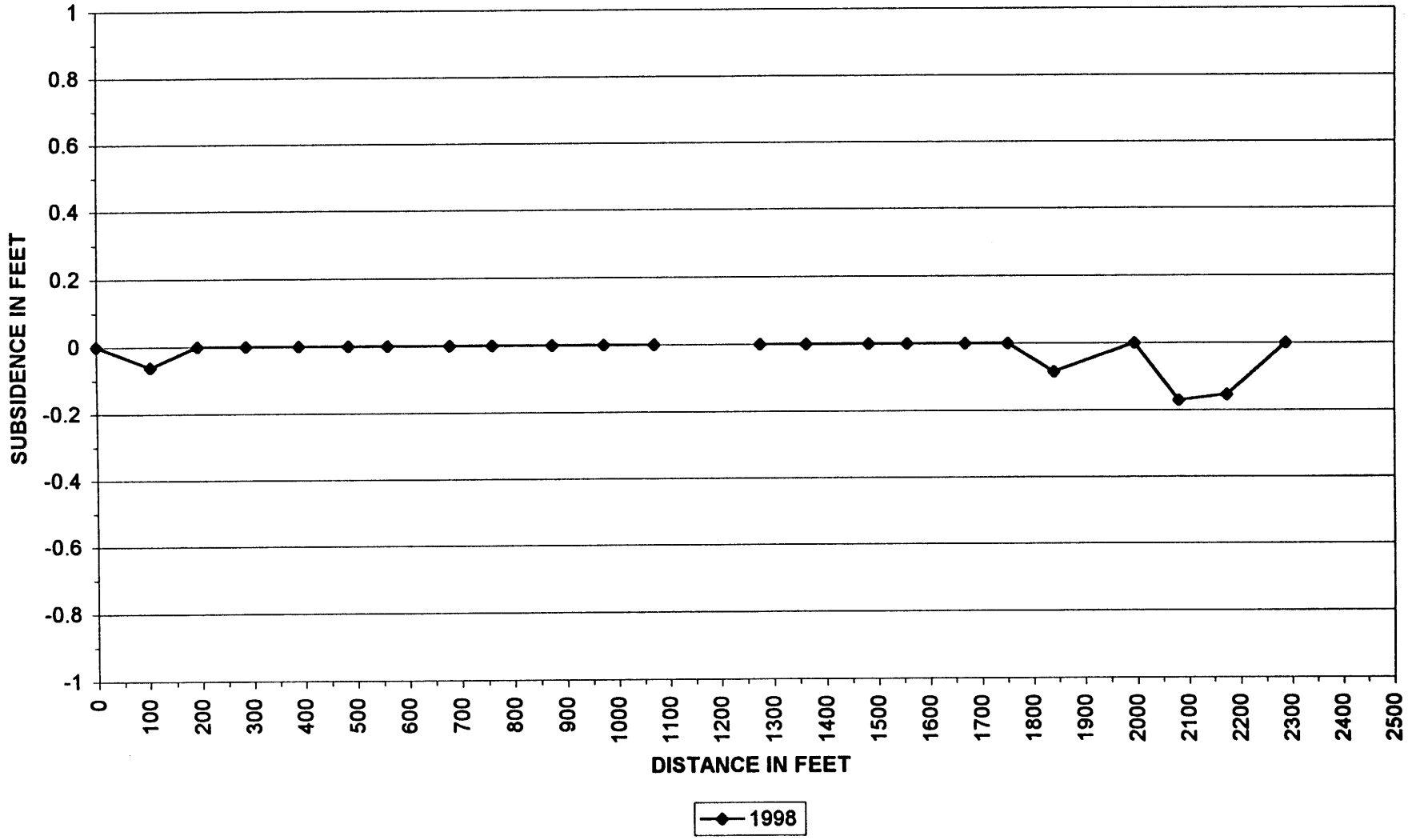


FIGURE 2
SECTION BC



CASTLE GATE

BARN CANYON DIVERSION CGD-5

MONITORING POINTS

STATION		DISTANCE FROM TOP OF PIN TO FLOW LINE				CHANGE	
	ORIG. 12/94	QUARTER 1 1995	QUARTER 2 1995	QUARTER 3 1995	QUARTER 4 1995	LAST	ACC
#1	2.68	2.69	2.70	2.69	2.66	+0.03	+0.02
#2	2.13	*1.97	2.00	1.96	1.95	+0.01	+0.18
#3	2.64	**2.40	2.40	2.40	2.36	+0.04	+0.04

STATION	QUARTER 1 1996	QUARTER 2 1996 06/28/96	QUARTER 3 1996 09/26/96	QUARTER 4 1996 12/10/96	LAST	ACC
#1	2.66	2.64	2.55	2.55	0.09	0.13
#2	* 1.85	1.79	2.15	2.15	-0.36	-0.02
#3	2.36	2.20	2.38	2.30	-0.18	+0.10
STATION	QUARTER 1 1997 03/26/97	QUARTER 2 1997 06/23/97	QUARTER 3 1997 09/04/97	QUARTER 4 1997 11/19/97	LAST	ACC
#1	2.55	2.55	2.58	2.49	0.09	0.19
#2	2.00	1.6	1.88	1.99	-0.11	0.14
#3	2.35	2.37	2.50	2.62	-0.12	0.02
	QUARTER 1 1998 03/20/98	QUARTER 2 1998 05/19/98	QUARTER 3 1998 09/24/98	QUARTER 4 1998 11/18/98	LAST	ACC
#1	2.50	2.50	2.40	2.45	-0.05	0.23
#2	1.78	1.50	1.60	1.80	-0.20	0.33
#3	2.63	2.60	2.40	2.54	-0.14	-0.14

NOTE:

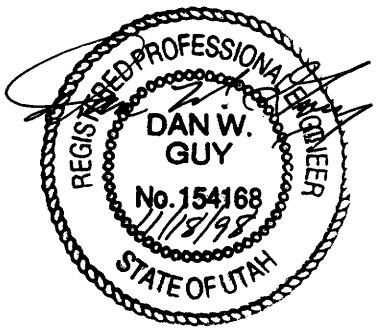
(1) *All stations were installed on 12/13/94.*

(2) *Cross-sections will be taken annually.*

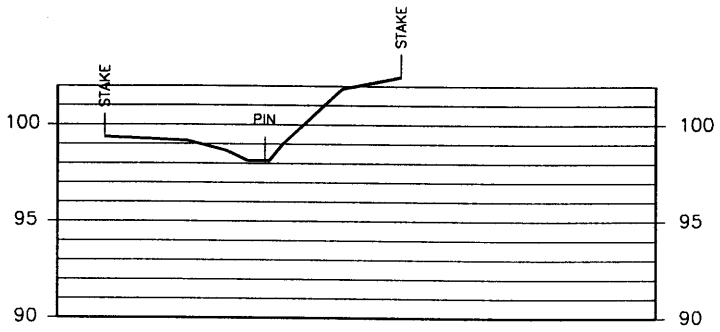
(3) *Measurements from top of pin to the flowline will be taken quarterly.*

* *Increase due to Side Sluffage.*

** *Reset 03/29/95 - Originally in Frozen Ground.*



CASTLE GATE DIVERSION CGD-5 MONITORING POINTS CROSS-SECTIONS



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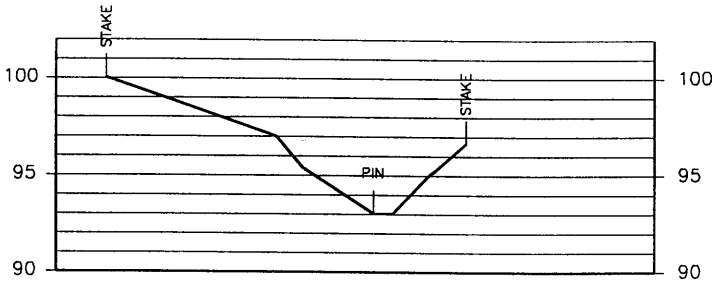
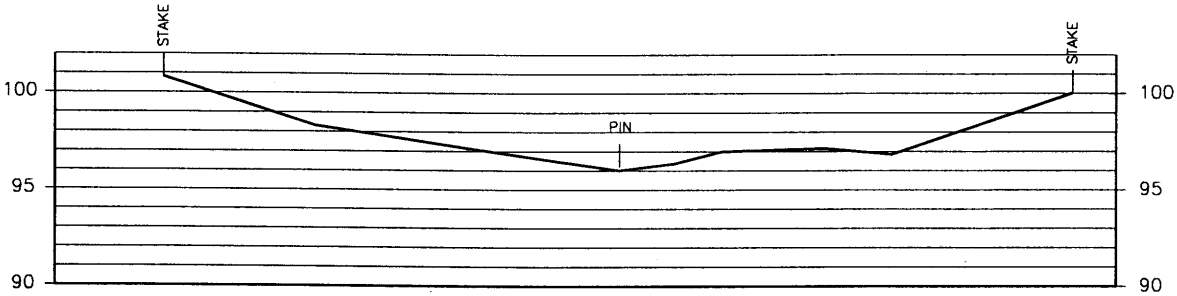


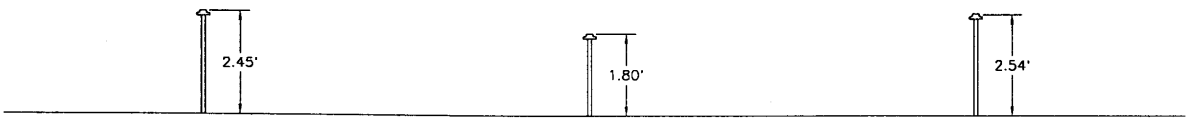
CROSS-SECTION #2



CROSS-SECTION #1

REGISTERED PROFESSIONAL ENGINEER
DAN W. GUY
No. 154168
11/14/98
STATE OF UTAH

NOTE: (1) SECTION VIEW LOOKING UP FROM BARN CANYON.
(2) ELEVATIONS ARE RELATIVE.
(3) SCALE 1" = 10'



CROSS-SECTION #1 CROSS-SECTION #2 CROSS-SECTION #3

11/18/98

APPENDIX C

Legal, Financial, Compliance and Related Information

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

and other changes in ownership and control information
as required under R645-301-110.

CONTENTS

STATE OF UTAH
DEPARTMENT OF COMMERCE
DIVISION OF CORPORATIONS AND COMMERCIAL CODE
PHONE: (801) 530-4849

PROFIT CORPORATION ANNUAL REPORT

The following information is on file in this office. All profit corporations must file their annual reports and corrections within the month o
Their anniversary date. Failure to do so will result in Delinquency, Revocation or Involuntary Dissolution of the corporate charter.

THIS BOX MUST BE COMPLETED

CORPORATE NAME, REGISTERED AGENT, REGISTERED OFFICE, CITY, STATE & ZIP

CORPORATION # 099984
F 09/13/82
1. CYPRUS PLATEAU MINING CORPORATION
2. C T CORPORATION SYSTEM
3. 50 W BROADWAY 8TH FLOOR
4. SALT LAKE CITY UT 84101-2006

MAKE ALL CORRECTIONS IN THIS COLUMN

UTAH

WHEN CHANGING THE REGISTERED AGENT THE NEW AGENT MUST SIGN.

5. INCORPORATED IN THE STATE AND UNDER THE LAWS OF: DELAWARE

6. ADDRESS OF THE PRINCIPAL OFFICE IN THE HOME STATE.
PO DRAWER PMC
PRICE UT 84501

7. BUSINESS PURPOSE: BITUMINUS COAL.(UNDERGROUND)

DOMESTIC PROFIT CORPORATIONS ARE REQUIRED TO LIST A CORPORATE OFFICER.

OFFICERS

8. PRESIDENT	J M DENICHIEI	8
ADDRESS	9100 E MINERAL CR	
CITY, STATE & ZIP	ENGLEWOOD CO 80155	
9. VICE PRESIDENT	G J MALYS SR	9
ADDRESS	9100 E MINERAL CIRCLE	
CITY, STATE & ZIP	ENGLEWOOD CO 80112	
10. SECRETARY	PC WOLF	10
ADDRESS	9100 E MINERAL CR	
CITY, STATE & ZIP	ENGLEWOOD CO 80155	
11. TREASURER	~~F J KANE~~	11. F.S. Hakimi
ADDRESS	9100 E MINERAL CR	
CITY, STATE & ZIP	ENGLEWOOD CO 80156	

DIRECTORS

12. DIRECTOR	~~G R SPINDLER~~	12. J.M. DeMichiei
ADDRESS	9100 E MINERAL CR	
CITY, STATE & ZIP	ENGLEWOOD CO 80155	
13. DIRECTOR	G. J. MALYS	13.
ADDRESS	9100 EMINERAL CIRCLE	
CITY, STATE & ZIP	ENGLEWOOD CO 80112	
14. DIRECTOR	PC WOLF	14.
ADDRESS	9100 E MINERAL CR	
CITY, STATE & ZIP	ENGLEWOOD CO 80155	

Under penalties of perjury and as an authorized officer, I declare that this annual report and, if applicable, the statement change of registered office and/or agent, has been examined by me and is, to the best of my knowledge and belief, true, correct, and complete.

15. BY: [signature]
16. Assistant Secretary (Title or Position)
17. SEP 25 1998 (Date) 19

IF THERE ARE NO CHANGES FROM THE PREVIOUS YEAR, AND YOU HAVE ALL CORPORATE REQUIREMENTS FILLED PERTAINING TO OFFICER AND DIRECTOR INFORMATION YOU MAY DETACH THE COUPON BELOW, AND RETURN IT IN THE ENCLOSED ENVELOPE WITH YOUR PAYMENT. YOU MAY KEEP THE ABOVE REPORT FOR YOUR RECORDS.

MAKE ALL CORRECTIONS ON THE FORM ABOVE.

DO NOT WRITE ON THE COUPON. CHANGES ARE MADE ON THE FORM ABOVE

NOTE: PLEASE DO NOT FOLD THIS COUPON.

CORPORATION NUMBER: 099984
CORPORATION NAME: CYPRUS PLATEAU MINING CORPORATION
C T CORPORATION SYSTEM
50 W BROADWAY 8TH FLOOR
SALT LAKE CITY UT 84101

DATE DUE: 09/30/98
AMOUNT DUE: $10.00
IF AFTER DUE DATE: $20.00

↑5070008000670500000001040999840000000000000000010008↑

UTAH DEPARTMENT OF COMMERCE
P.O. BOX 25125
SALT LAKE CITY, UTAH 84125-0125

Make check payable to:
State of Utah

For information call:
(801) 530-4849

Cyprus Plateau Mining Corporation
9100 East Mineral Circle
Englewood, Colorado 80112

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APPENDIX D

Mine Maps

as required under R645-301-525.270.

CONTENTS

APPENDIX E

Other Information

in accordance with the requirements of R645-301 and R645-302.

CONTENTS

March 12, 1999

Mr. Johnny Pappas
Cyprus Plateau Mining Corporation
847 Northwest Highway 191
Helper, UT 84526

Re: Special Condition No. 12 on U.S. Army Corps of Engineers Permit No. 199450397

Dear Mr. Pappas:

This letter serves as an assessment of the function and stability of the relocated Willow Creek stream channel, as required by Special Condition No. 12 of U.S. Army Corps of Engineers Permit No. 199450397. SWCA provided similar assessments to Cyprus Plateau in 1997 and 1998 (SWCA 1997, SWCA 1998). SWCA (1997) included a summary of SWCA's involvement in the Willow Creek stream relocation project.

1998 Regional Hydrologic Summary

Above average precipitation in Water Year (WY) 1998 resulted in above average discharge in Willow Creek and other regional streams, as was the case in 1997. While Willow Creek discharge is not currently recorded by the United State Geological Survey, a USGS gauging station (#09313000) is located on the Price River just below the confluence of the Price River and Willow Creek. Analysis of USGS data for this station shows that discharge in 1998 was above the long-term average (Fig. 1). The mean annual discharge for WY 1998 at the Price River station was 155 cfs, compared to the mean annual discharge of 152 cfs for WY 1997 and 111 cfs for the long-term mean annual discharge. The recurrence interval of the WY 1998 mean annual discharge was 6.6 years, compared to 5.8 years for WY 1997 (Fig. 2).

(Note: In pulling together this year's report, an error was discovered in the reporting of last year's hydrologic data. The mean annual flow and recurrence interval for WY 1997 was reported to be 158 cfs and 8.2 years, respectively. After data correction, it was determined that these numbers should have been reported as 152 cfs and 5.8 years.)

Willow Creek Stability Assessment

Based on a site inspection of Willow Creek conducted on May 24, 1998 by SWCA, the relocated channel was stable and functional. On this date, flow was overtopping the box weirs that Cyprus installed above and below the relocated channel. Discharge was higher than when SWCA inspected the creek relocation in 1997 (photos A through F, Figs. 3-5). The stream channel was successfully conveying flow and no streambank or channel structural failure was noticeable. The step-pool complexes in the relocated channel were in place, although flows were so high they were overtopping the entirety of most of the rock dam features. However, I observed areas of slack water due to the structural diversity designed into the channels (Figs. 3-5).

The rockdams and habitat features built in the relocated stretch of Willow Creek appear to have held up well under two years of above average discharge conditions (back-to-back years with 6/7-year recurrence intervals). Figure 6 compares 1998 conditions (photos G and H) with those photographed in 1996 and 1997 (Figures 3 and 4 in SWCA 1998) at Willow Creek. Figure 7 compares 1998 conditions (photos I and J) with those photographed in 1996 (Photos 1 and 2 in SWCA 1997, p.4) at Willow Creek. Comparison of these photos show that no boulders or rockdams show any significant sign of movement as a result of the high flows.

Monthly discharge measurements made by Cyprus Plateau at the box weirs above and below the relocated stretch of Willow Creek show that the relocated channel is adequately passing flows (Figure 8). This supports the conclusion made in SWCA (1998) that (a) storm events have resulted in sediment deposition within the void spaces of the riprap, and (b) the lower stretch of the relocation, where a 36' deep pit was excavated and refilled in late spring 1996 to remove soil contaminated with diesel fuel, is no longer a "losing" stretch of river, as was the case in the summer 1996 post-construction period.

Conclusion

The conclusions reached in last year's report are reinforced by conditions observed in 1998. Those conclusions, restated this year, are:

- The relocated section of Willow Creek continues progression toward providing its designed functionality.
- The channel features held up well under high flow conditions in 1998 with no evidence of instability of structural and habitat features.
- The step-pool design allowed for a variety of flow environments, including areas of rapid flow and calm areas.
- Sediment deposition in riprap void spaces appears to have sealed the relocated channel so that it is conveys all flows entering its upstream end to its downstream end.

Please call me if you have any questions concerning these findings.

Sincerely,

Howard Gross
Watershed Ecologist
SWCA Inc., Environmental Consultants

Memos Referenced

SWCA, Inc. 1998. Special Condition No. 12 on U.S. Army Corps of Engineers Permit No. 199450397. Memo from Howard Gross, SWCA, Inc. Environmental Consultants (Salt Lake City), to Johnny Pappas, Cyprus Plateau Mining Corp., dated March 5, 1998.

SWCA, Inc. 1997. Special Condition No. 12 on U.S. Army Corps of Engineers Permit No. 199450397. Memo from Howard Gross, SWCA, Inc. Environmental Consultants (Salt Lake City), to Ben Grimes, Cyprus Plateau Mining Corp., dated January 16, 1997.

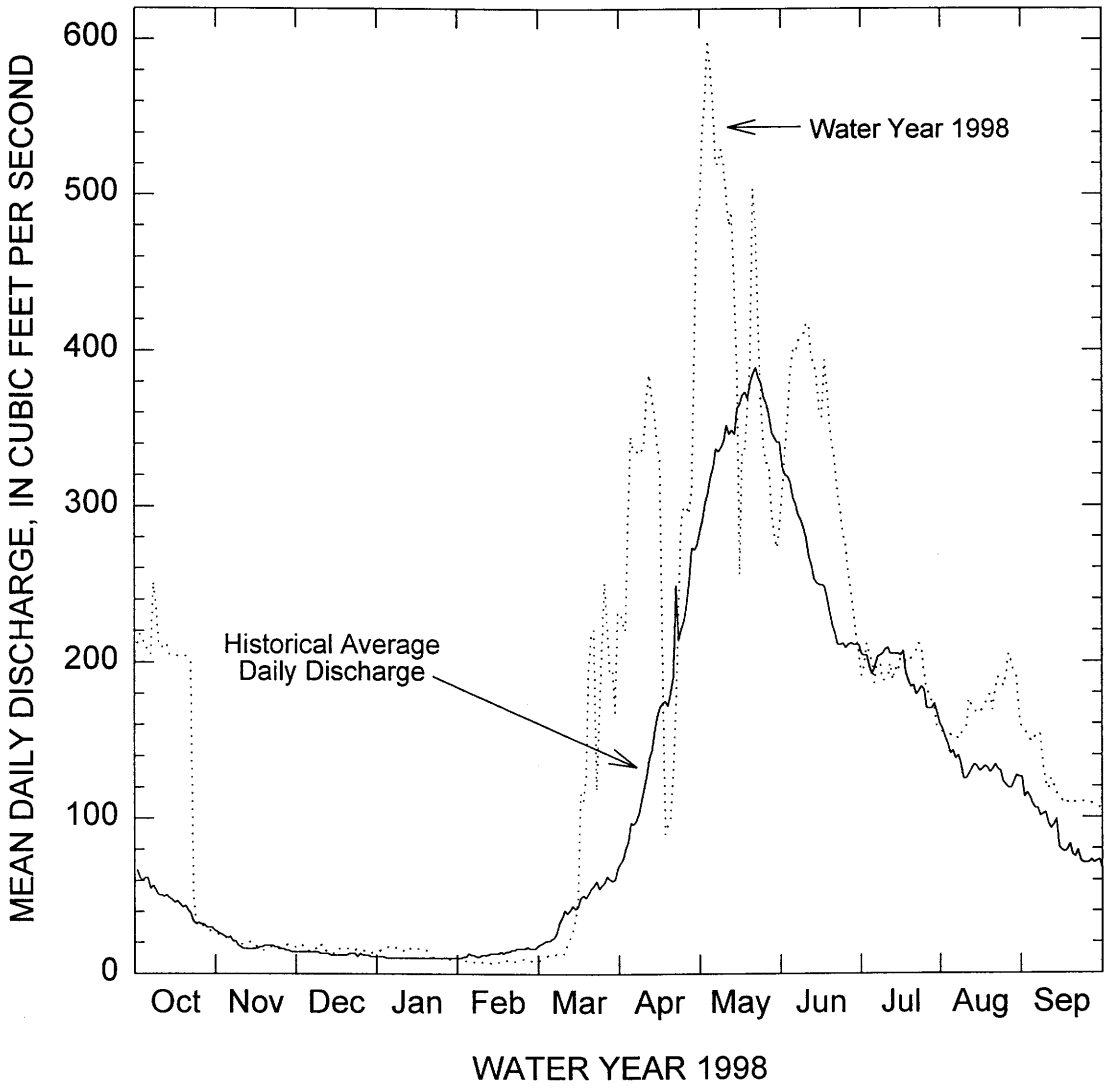


Figure 1. Graph showing annual hydrograph of average daily discharge for October 1, 1997 to September 30, 1998 and mean daily discharge for the period of record from 1934-1970, 1980-1982, and 1990-1998 for Price River near Heiner, Utah 09313000.

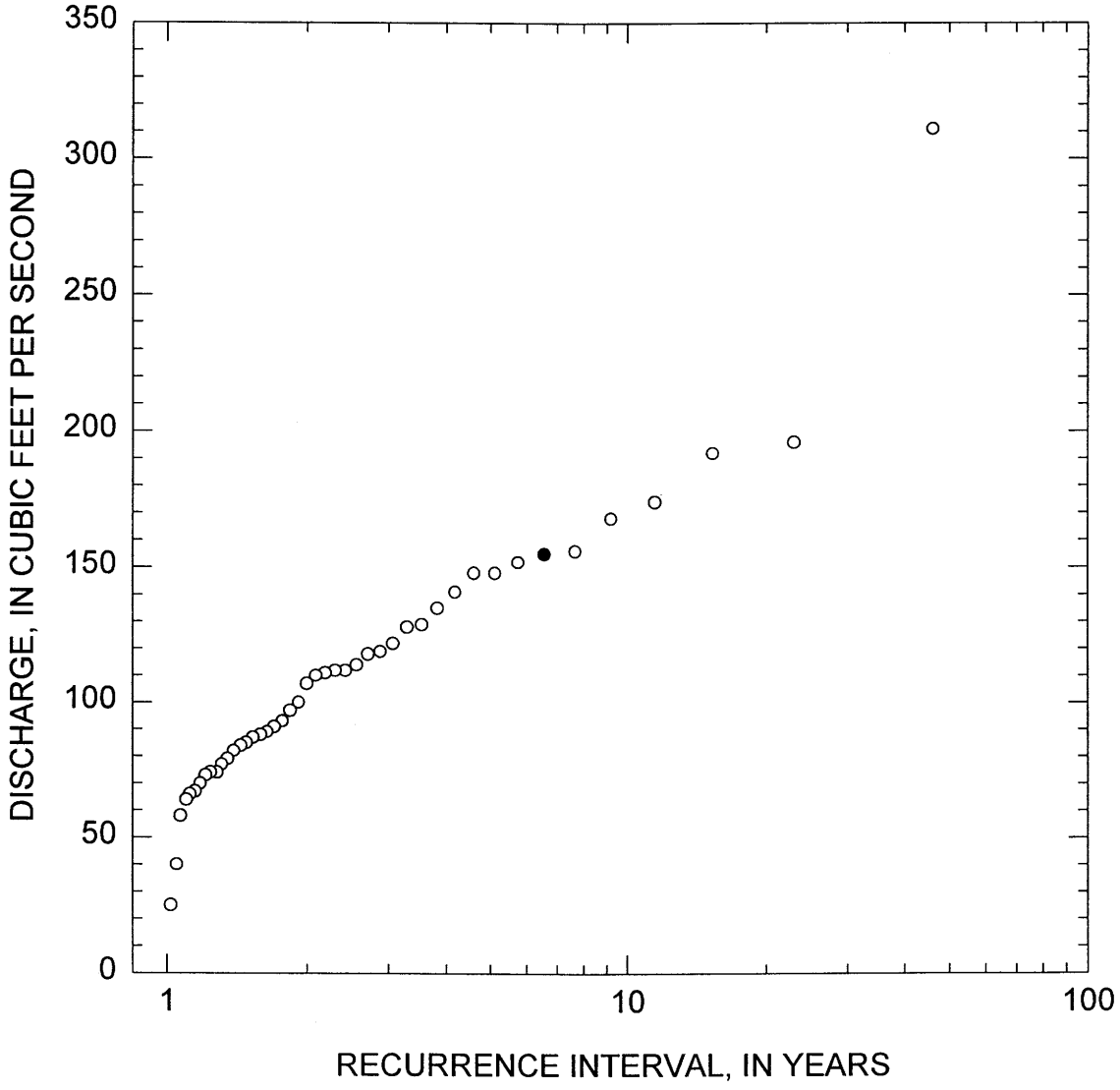


Figure 2. Recurrence interval for mean annual discharge at Price River near Heiner, Utah (station number 09313000). Black circle is for Water Year 1998.

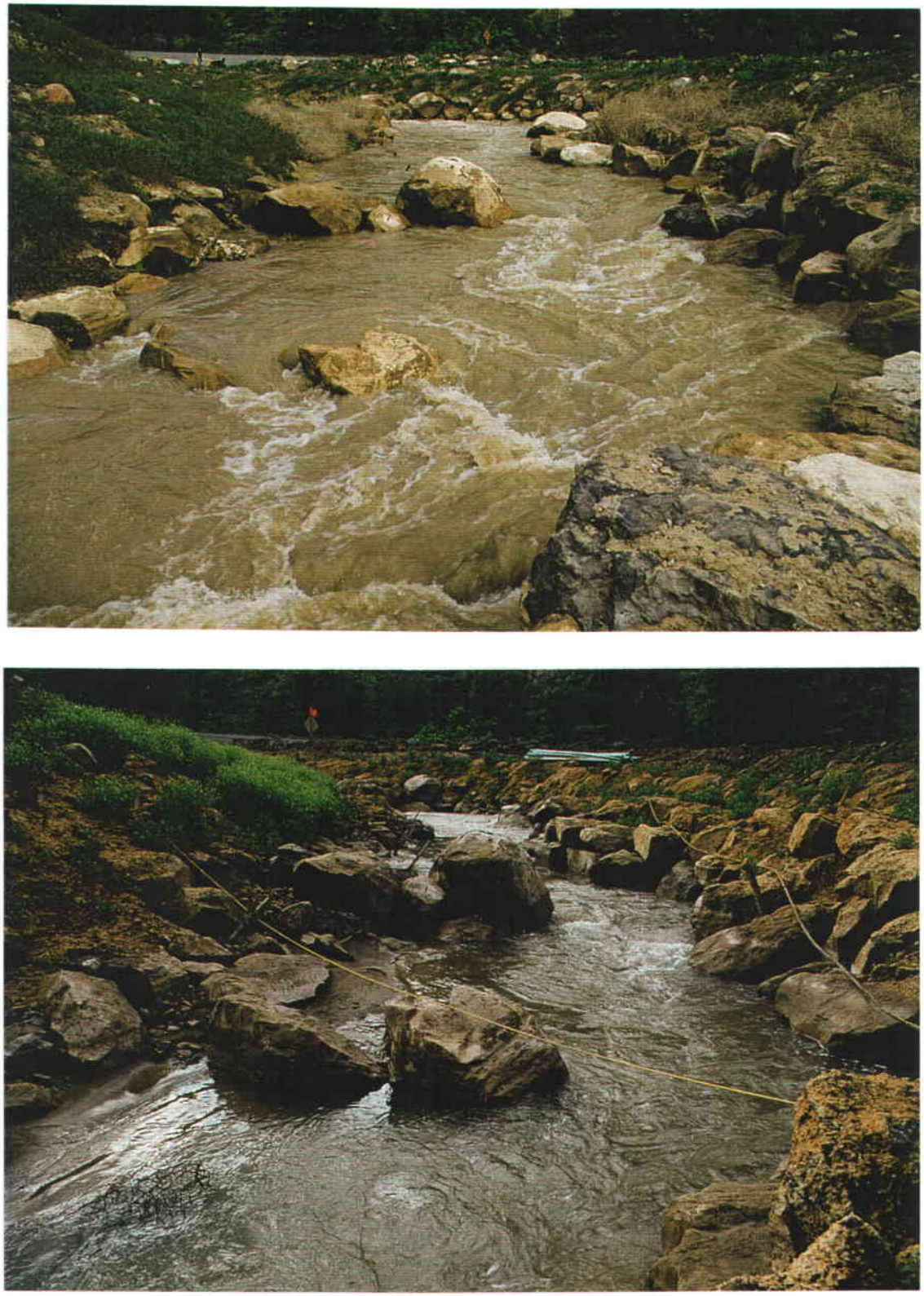


Figure 3. Photo A (top, may 24, 1998) and B (bottom, June 10, 1997). Photos taken of lower stretch of Willow Creek stream relocation. Note identical boulders in each photo and the higher flows of these two dates occurring in 1998.

Figure 4. Photo C (top, may 24, 1998) and D (bottom, June 10, 1997). Photos taken of upper stretch of Willow Creek stream relocation. Note identical boulders in each photo and the higher flows of these two dates occurring in 1998.

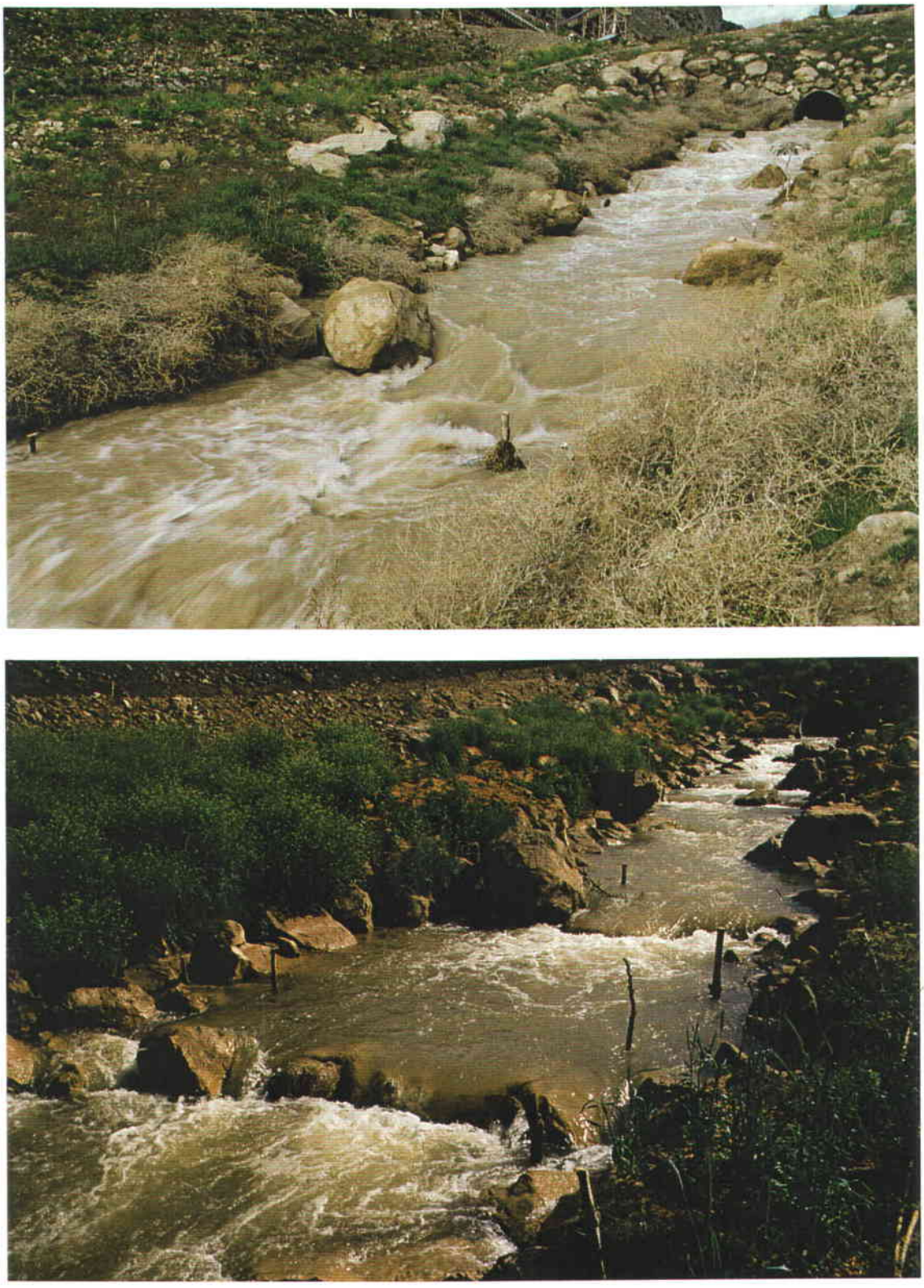


Figure 5. Photo E (top, may 24, 1998) and F (bottom, June 10, 1997). Photos taken at upper end of lower stretch of Willow Creek stream relocation, just below large culvert. Note identical boulders in each photo and the higher flows of these two dates occurring in 1998.

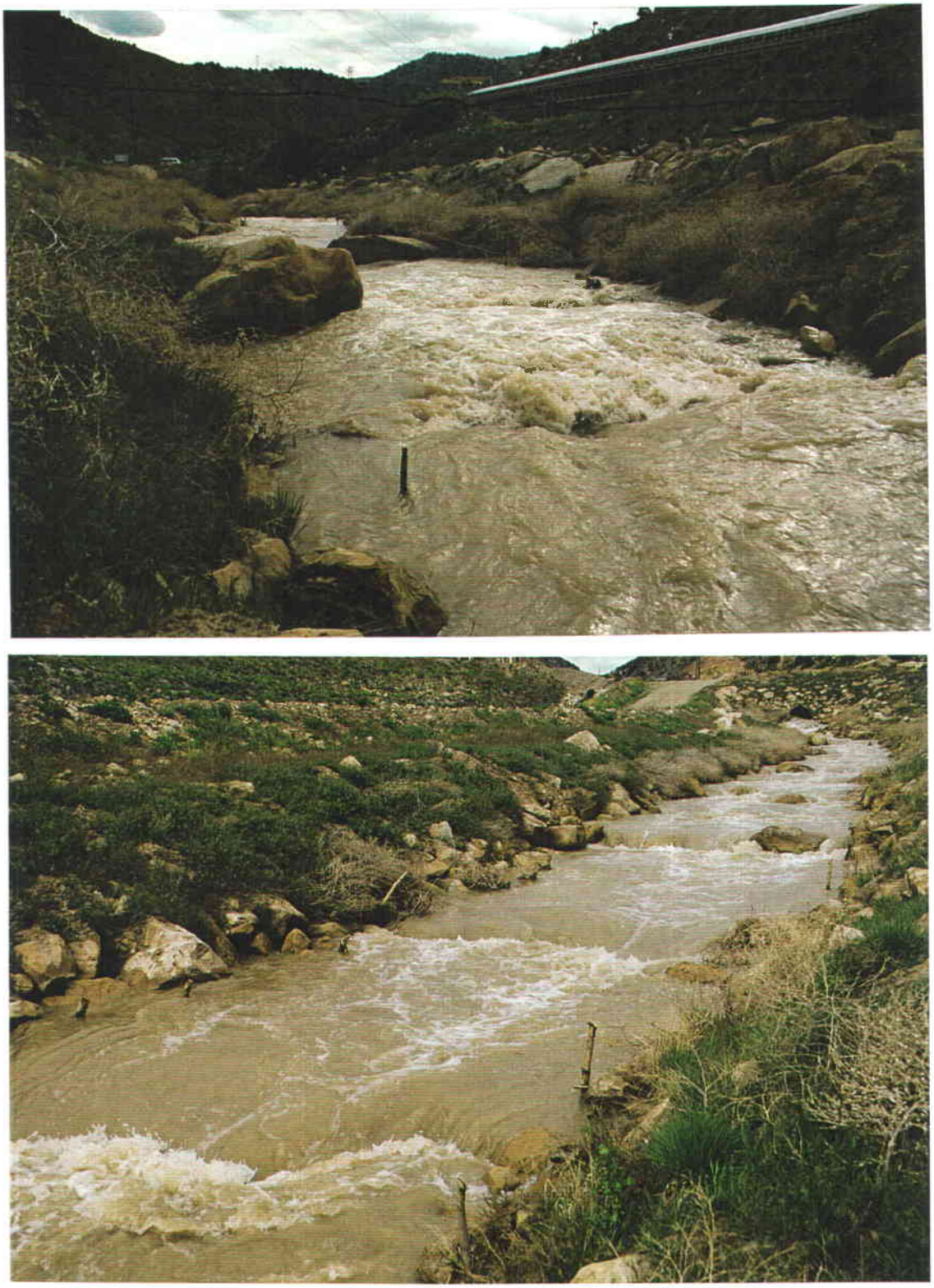


Figure 6. Willow Creek relocation, June 10, 1998. Photo G (top), upper end of upper stretch, and photo H (bottom), middle part of lower stretch. Photo G compares with Figure 3 in SWCA (1998) and photo H compares with Figure 4 in SWCA (1998).

Figure 7. Willow Creek relocation, June 10, 1998. Photo I (top) and photo J (bottom) both of the lower portion of the upper stretch of Willow Creek stream relocation. Photos H and I compare with photos 1 and 2 (SWCA 1997, p. 4), respectively.

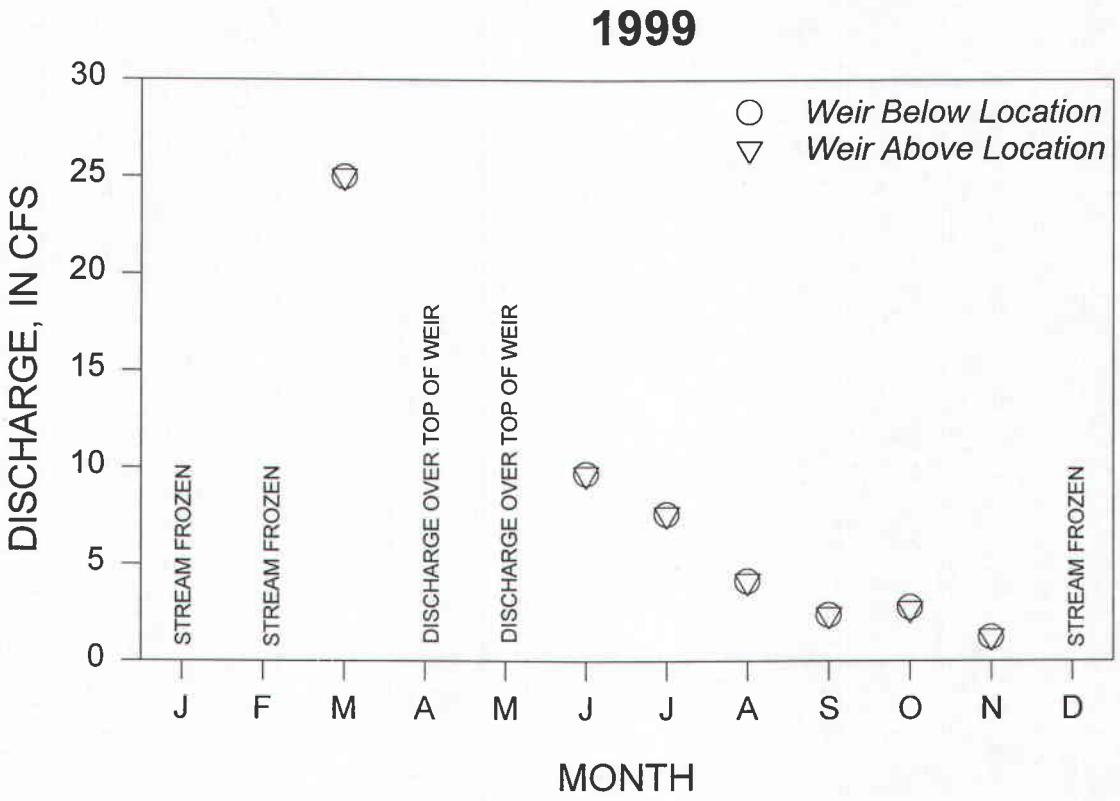


Figure 8. Flow at weirs above and below Willow Creek stream reloaction, 1998.

Fish Monitoring Study Conducted for the Willow Creek Coal Mine, 1998

Prepared for:

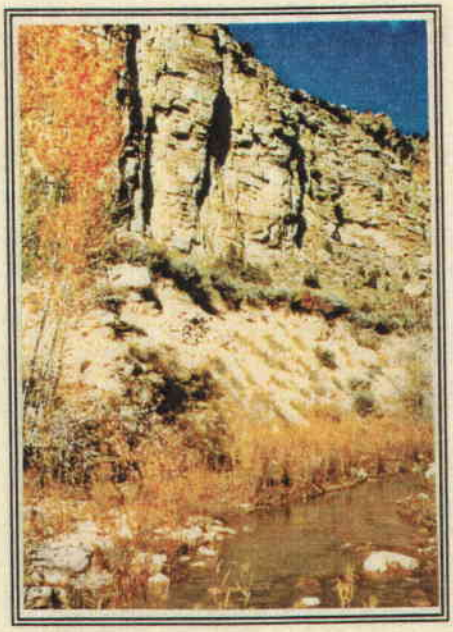
CYPRUS PLATEAU MINING CORPORATION

Helper, Utah

Prepared by:

HYDROBIOS CONSULTANTS

Fort Collins, Colorado



December, 1998

Fish Monitoring Study Conducted for the Willow Creek Coal Mine, 1998

Prepared for:

CYPRUS PLATEAU MINING CORPORATION

Helper, Utah

Prepared by:

HYDROBIOS CONSULTANTS

Fort Collins, Colorado

December, 1998

Table of Contents

List of Tables

List of Figures

1.0 INTRODUCTION

Cyprus Plateau Mining Corporation (Cyprus) began operating the Willow Creek Coal Mine in May 1996. The mine, which is located approximately 4 miles north of Helper, Utah, is situated in the lower portion of Willow Creek Canyon. Two segments of Willow Creek were relocated in June through August of 1996 to allow additional area for mine facilities. The design of the new diversion segments was approved by the Utah Division of Oil, Gas, & Mining (UDOGM), the U.S. Army Corps of Engineers (COE), the State Water Rights Engineer, and the Utah Division of Wildlife Resources (UDWR). The lengths of the upper and lower diversion segments were approximately 300 and 800 feet (ft), respectively.

Willow Creek, which is a perennial stream located adjacent to the Cyprus Willow Creek Coal Mine, is considered a Class 4 stream by the UDWR. This classification is defined as a stream with low recreational fishing potential. Based on previous baseline and monitoring studies in Willow Creek, the stream supports low numbers of three game fish species, rainbow trout, cutthroat trout, and brown trout. No Federal or state-listed fish species are known to occur in Willow Creek.

As part of required monitoring for the Willow Creek Coal Mine, fish population surveys were conducted in Willow Creek during 1997 and 1998. These studies repeated the same sampling methods that were used during 1995 baseline studies. The 1997 monitoring studies also included benthic macroinvertebrate surveys. Both fish and macroinvertebrate data resulting from the 1997 monitoring studies were compared to the 1995 baseline data in a separate report prepared by HydroBios Consultants (1998). After reviewing the 1997 data, UDWR decided that the 1998 monitoring studies only needed to include fish sampling, which is the subject of this report.

The purpose of the fish monitoring studies was twofold: (1) determine if any dramatic changes have occurred in the fish community in terms of species composition and abundance after mining activities were initiated; and (2) evaluate if the fish community has become established in the diversion segments. The 1998 results are compared to 1995 and 1997 data to evaluate these two topics.

The following summary provides background information on Willow Creek flows during 1996 through 1998. After construction was completed in August 1996, surface flow was resumed and continued throughout the year in the upper diversion segment. However, when

the surface water reached the lower diversion segment, flow moved into the subsurface materials due to a design consisting of rock substrate without fine materials. Water flowed beneath the rock surface in the lower diversion segment for portions of the remainder of the year. During rainfall events in August and September, the lower segment exhibited surface flow for short periods of time (typically one to three days); otherwise, surface flow was lacking. In mid-August 1996, a portion of the lower segment was sealed with a soil and bentonite mixture in an attempt to seal the interstitial spaces around the rocks and restore surface flow. Although the soil/bentonite mixture was effective in a localized area, the agencies decided that the same effort was not justified for the entire lower segment. Since natural flow in Willow Creek during the post-construction period was low due to lack of precipitation, sufficient surface flow was not available to fill the void spaces and deposit sediments that would seal the spaces. In total, surface flow was absent or extremely low in the lower diversion segment for approximately seven months (August 1996 through early March 1997).

Flow in Willow Creek from the lower diversion segment downstream to the Price River also was very low due to water loss in the lower relocated segment and minimal natural runoff conditions. At times from August through December 1996, flow was absent all the way to the Price River. Significant flow was not resumed in Willow Creek until spring runoff began in early March 1997. The winter of 1996/1997 was relatively mild and wet, which resulted in an earlier than normal runoff; typically runoff in Willow Creek begins in April. The high spring flows in 1997 carried the necessary silt that sealed the rock interstitial spaces.

Since March 1997, continuous flow existed in Willow Creek all the way to the Price River. Flows in 1998 were relatively high in the spring due to snow melt, which was followed by below-average levels during the summer and fall. In June through October 1998, discharge estimates ranged from 2.7 to 9.7 cubic feet per second (cfs) at the Cyprus weirs. In comparison, discharge estimates for the same period in 1997 varied from 3.7 to 12.9 cfs. The weirs are located slightly upstream and downstream of the diversion segments.

2.0 METHODS

Fish surveys were conducted in late June/early July and October 1998 at six locations in Willow Creek. One reference location (WC-1R) was established upstream of the project study area, while five locations were sampled in Willow Creek in an area adjacent to the Cyprus Willow Creek Coal Mine. Two locations, WC-4D (upper diversion) and WC-5D (lower diversion), were new locations that were established in the diversion channels and sampled in 1997 and 1998. In 1995, locations WC-4 and WC-5 were situated in Willow Creek prior to construction of the diversion channels. Sampling locations are shown in Figure 2-1. UTM coordinates and township, range, and section designations for the sampling locations are provided in Table 2-1.

Table 2-1
Fish Sampling Locations

Sampling Designation	Township, Range, Section	UTM Coordinates
WC-1R	T12S, R10E, S31, NE 1/4, NE 1/4	X513880E Y4398990N
WC-2	T12S, R10E, S31, SW 1/4, NE 1/4	X512990E Y4398095N
WC-3	T12S, R10E, S31, SW 1/4, SW 1/4	X512720E Y4397820N
WC-4D	T13S, R10E, S6, NW 1/4, NW 1/4	X512600E Y4397620N
WC-5D	T13S, R9E, S1, NE 1/4, SE 1/4	X512320E Y4397420N
WC-6	T13S, R9E, S1, NE 1/4, SW 1/4	X512075E Y4397420N

The following information describes the fish sampling methodologies that were used in the monitoring studies. Fish population surveys were conducted on June 30/July 1 and October 13/14, 1998. Sampling at each location consisted of electrofishing the entire length of the segment (about 100 feet [ft] long). The fish population studies began in the lower portion of Willow Creek at location WC-6 and proceeded in an upstream direction to minimize any disturbance to the sampling locations. After marking the upper and lower ends of the segment with wooden stakes, a fine mesh seine net was used to block the ends of the segment. A two-pass removal method (Seber and LeCren 1967) was used to estimate fish numbers at each location. Three biologists electrofished the segment by walking slowly in an upstream

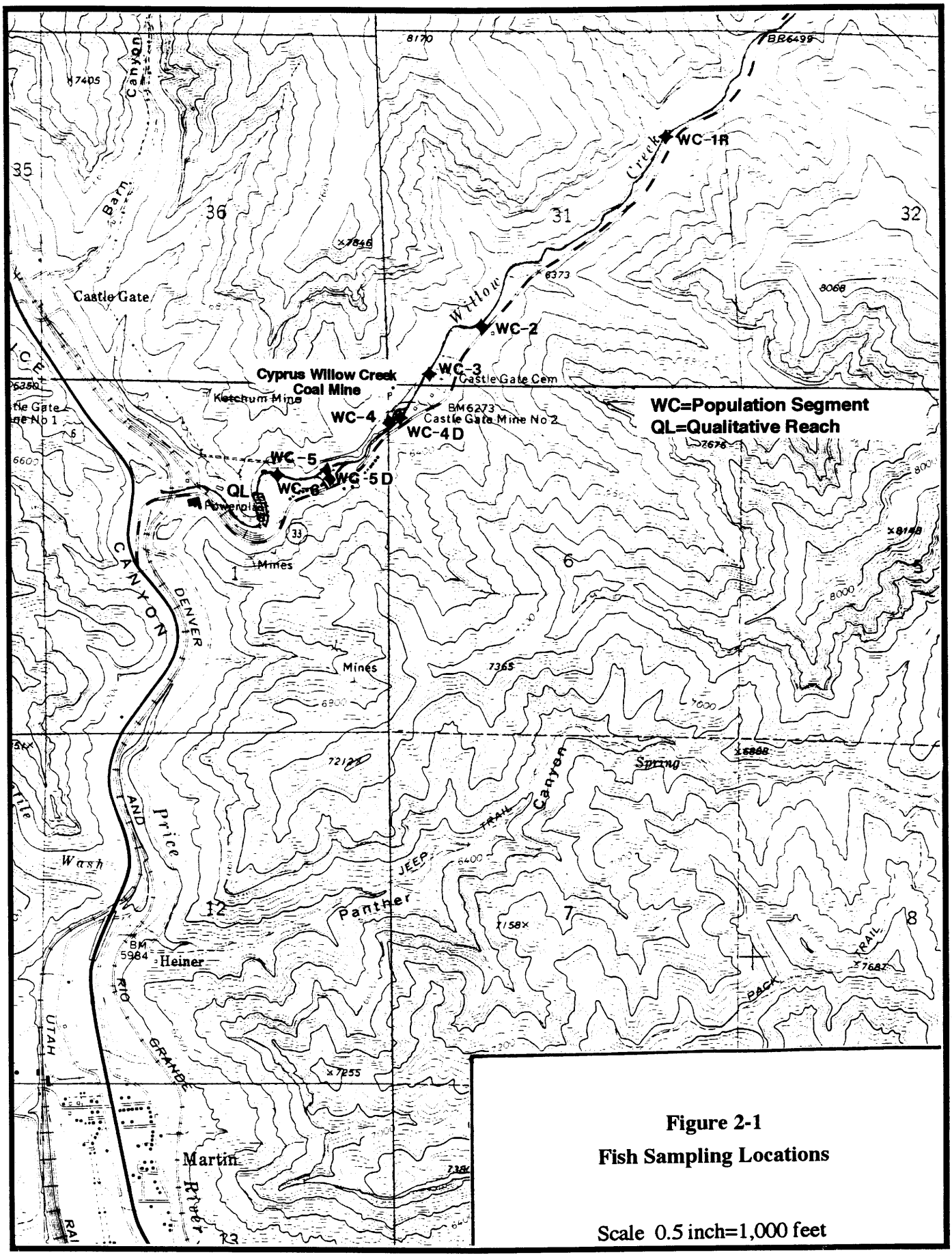


Figure 2-1
Fish Sampling Locations

Scale 0.5 inch=1,000 feet

direction starting at the lower block net. All stunned fish were netted and placed in a plastic bucket for processing. After completing the initial pass through the segment, all fish were identified and enumerated. Non-trout species such as speckled dace (*Rhinichthys osculus*) and mountain sucker (*Catostomus platyrhynchus*) were enumerated by general age classifications such as young-of-the-year (YOY), juvenile, and adult. No weights were taken for non-trout species. All trout were identified and enumerated by species and measured for total lengths in millimeters and weights in grams. After processing fish from the first pass, they were returned to an area located at least 100 ft downstream of the lower block net. Care was taken to minimize handling of the fish and complete field processing in a timely manner to reduce possible fish mortalities. The second pass was made through the segment to collect and process fish in the same manner as described for the first pass. The presence of any state listed or federal candidate species was noted during both passes. All information was recorded on field data sheets.

The following equation was used for estimating populations for each species at each sampling location:

$$N = \frac{(U_1)^2}{(U_1 - U_2)}$$

Where: N = population estimate;
U_1= number of fish removed during the first pass; and
U_2= number of fish removed during the second pass.

Data resulting from the fish population surveys included population estimates at each location, composition by general age classifications, and length/weight summaries for trout species. Population estimates were expressed as the number of fish per 100 ft length of stream. Trout biomass was expressed as pounds per 1,000 ft^2.

Qualitative sampling for trout also was conducted on June 30 and October 13, 1998 in a 500-ft section of Willow Creek. The lower portion of the site was located approximately 900 ft downstream of WC-6. Trout were identified and measured for total length (millimeters) and weight (grams). The presence of other fish species was noted.

3.0 RESULTS AND DISCUSSION

In 1998, six fish species (including one hybrid trout) were collected in Willow Creek (Table 3-1). Four of the species (rainbow trout, mountain sucker, speckled dace, and redside shiner) were present during all previous sampling efforts. Brown trout and rainbow X cutthroat trout hybrid were collected in October during both 1997 and 1998. The following sections discuss the results of the 1998 sampling effort for trout and native nongame species. Comparisons also were made between 1998 and previous sampling conducted in 1997 and 1995.

Table 3-1
Fish Species Collected in Willow Creek, 1995, 1997, and 1998

Species		1995		1997		1998	
Common Name	Scientific Name	June	Oct	July	Oct	June/ July	Oct
Trout	Salmonidae						
Cutthroat Trout	*Oncorhynchus clarki*		X		X		
Rainbow Trout	*Oncorhynchus mykiss*	X	X	X	X	X	X
Rainbow X Cutthroat Hybrid	*O. clarki X O. mykiss*				X		X
Brown Trout	*Salmo trutta*				X		X
Suckers	Catostomidae						
Bluehead sucker	*Catostomus discobolus*	X					
Mountain sucker	*Catostomus platyrhynchus*	X	X	X	X	X	X
Minnows	Cyprinidae						
Utah chub	*Gila atraria*				X		
Speckled dace	*Rhinichthys osculus*	X	X	X	X	X	X
Redside shiner	*Richardsonius balteatus*	X	X	X	X	X	X

3.1 TROUT

Two trout species (rainbow and brown) and one rainbow X cutthroat hybrid were collected during the 1998 surveys. Rainbow trout was present during both summer and fall sampling efforts, while brown trout and the rainbow X cutthroat hybrid were limited to the fall (Table 3-1). These occurrence patterns were the same as exhibited in 1997. Of the two trout species and one hybrid, rainbow trout was the only one that was distributed throughout most of the study area (i.e., four of six sampling locations in October 1998) (Tables 3-2 and 3-3). Rainbow trout also was the most widely distributed trout species in 1997 and 1995 (see Appendices B and C for the 1997 and 1995 results, respectively).

In 1998, total trout numbers ranged from 0 to 2/100 ft segment, which was similar to numbers reported in 1995 and 1997 (0 to 3/100 ft segment). As shown in previous years, trout numbers were slightly higher in the fall compared to the summer (Table 3-4). Trout numbers by individual species in 1998 are shown in Tables 3-2 and 3-3 (see Appendices B and C for the 1997 and 1995 results, respectively). When present, rainbow trout usually was the dominant trout species at all sampling locations. Lengths and weights of trout collected in 1998 are provided in Appendix A. The trout population was comprised entirely of adults in 1998. The only collection of a juvenile trout occurred in October 1997, when one juvenile rainbow was found at location WC-4D. All trout collected in 1998 and previous years appeared to be in good health, with no evidence of disease or parasites.

Trout biomass in Willow Creek varied between 0 and 0.89 pounds (lb.)/1,000 ft^2 in 1998; 0 and 0.75 lb./1,000 ft^2 in 1997; and 0 and 1.74 lb./1,000 ft^2 in 1995 (Table 3-5). The higher biomass in 1995 was mainly a reflection of the relatively smaller areas sampled in 1995, when low flow conditions resulted in narrower stream widths.

3.2 NATIVE NONGAME SPECIES

Of the five native nongame species collected in Willow Creek, the most common and widespread species included speckled dace and mountain sucker (Table 3-1). These two species were present at all six population locations and the qualitative reach during all three years. Redside shiner also was present within the qualitative sampling reach in all three years, but it was absent from the quantitative sampling locations in 1997 and 1998. The other two native nongame species, bluehead sucker and Utah chub, were collected in previous sampling efforts (Table 3-1).

Table 3-2

Fish Population Survey Conducted in Willow Creek, June 30 and July 1, 1998

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		0	0	
Juvenile	0	0		1	0		0	0	
Adult	7	5		4	3		5	1	
Total	7	5	25	5	3	13	5	1	6
Speckled dace									
YOY	0	0		0	0		0	0	
Juvenile	0	3		6	2		3	1	
Adult	22	10		24	14		17	13	
Total	22	13	54	30	16	64	20	14	67
Rainbow trout									
Adult	0	0	0	0	0	0	0	0	0
TOTAL FISH[1]	29	18	79	35	19	77	25	15	73

Species/Life Stage	WC-4D			WC-5D			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		0	0	
Juvenile	0	1		0	0		1	1	
Adult	4	0		5	3		6	1	
Total	4	1	5	5	3	13	7	2	10
Speckled dace									
YOY	0	0		1	1		0	0	
Juvenile	0	1		2	6		13	5	
Adult	25	9		11	3		22	18	
Total	25	10	42	14	10	49	35	23	102
Rainbow trout									
Adult	0	0	0	1	0	1	2	0	2
TOTAL FISH[1]	29	11	47	20	13	63	44	25	114

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

Table 3-3
Fish Population Survey Conducted in Willow Creek, October 13 and 14, 1998

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		2	0	
Juvenile	0	0		4	2		2	1	
Adult	7	6		4	3		6	5	
Total	7	6	49	8	5	21	10	6	25
Speckled dace									
YOY	0	0		4	0		1	0	
Juvenile	5	1		7	3		4	2	
Adult	18	13		31	10		29	14	
Total	23	14	59	42	13	61	34	16	64
Rainbow trout									
Adult	1	0	1	0	0	0	1	0	1
TOTAL FISH[1]	31	20	109	50	18	82	45	22	90

Species/Life Stage	WC-4D			WC-5D			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		0	0	
Juvenile	3	0		1	2		2	1	
Adult	4	4		5	1		2	2	
Total	7	4	16	6	3	12	4	3	16
Speckled dace									
YOY	3	0		1	1		4	3	
Juvenile	2	3		0	0		1	2	
Adult	22	5		6	2		5	3	
Total	27	8	38	7	3	12	10	8	50
Rainbow trout									
Adult	1	0	1	0	0	0	2	0	2
Brown Trout									
Adult	1	0	1	0	0	0	0	0	0
Rainbow X Cutthroat Hybrid									
Adult	0	0	0	1	0	1	0	0	0
TOTAL FISH[1]	36	12	56	14	6	25	16	11	68

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

Table 3-4

Total Trout Numbers (Number/100 Ft Segment) in Willow Creek

Sampling Locations	1995		1997		1998	
	June	Oct	July	Oct	June/July	Oct
WC-1R	0	1	0	1	0	1
WC-2	0	0	0	0	0	0
WC-3	1	1	1	2	0	1
WC-4	0	3	Not Sampled	Not Sampled	Not Sampled	Not Sampled
WC-4D	Not Sampled	Not Sampled	1	3	0	2
WC-5	3	2	Not Sampled	Not Sampled	Not Sampled	Not Sampled
WC-5D	Not Sampled	Not Sampled	1	1	1	1
WC-6	0	3	1	1	2	2

Table 3-5

Trout Biomass (Pounds/1,000 Ft^2) in Willow Creek

Sampling Locations	1995		1997		1998	
	June	Oct	July	Oct	June/July	Oct
WC-1R	0	1.15	0	0.62	0	0.89
WC-2	0	0	0	0	0	0
WC-3	0.42	1.56	0.53	0.75	0	0.70
WC-4	0	1.74	Not Sampled	Not Sampled	Not Sampled	Not Sampled
WC-4D	Not Sampled	Not Sampled	0.32	0.62	0	0.34
WC-5	0.88	1.05	Not Sampled	Not Sampled	Not Sampled	Not Sampled
WC-5D	Not Sampled	Not Sampled	0.23	0.21	0.17	0.12
WC-6	0	1.63	0.23	0.35	0.34	0.52

As shown in Tables 3-2 and 3-3, total fish densities in 1998 were dominated by speckled dace and mountain sucker. These two species collectively accounted for 87 to 100 percent of the fish densities at all sampling locations. In 1998, population estimates ranged from 5 to 49 mountain sucker/100 ft segment and 12 to 102 speckled dace/100 ft segment. In most

instances, populations for both species were dominated by adults at all sampling locations. In terms of density distribution in 1998, the highest mountain sucker densities occurred at the reference location (WC-1R). No distinct pattern of density distribution was evident for speckled dace in 1998. In 1997, the highest speckled dace densities were evident at the upper three sampling locations (WC-1R, WC-2, and WC-3).

Total fish densities were grouped so that summer and fall sampling efforts could be compared separately (Table 3-6; Figure 3-1). The comparisons indicated that fish densities in 1998 returned to similar or higher levels than those observed in 1995 at five of the six locations (WC-1R, WC-2, WC-3, WC-4, and WC-6). The only notable exception was evident at the lower diversion segment (WC-5D), where densities in October 1998 were 25 fish/100 ft segment compared to 49 fish/100 ft segment in October 1995. However, comparisons between the summer sampling efforts at WC-5D showed that densities in 1998 (63 fish/100 ft segment) were higher than 1995 (45 fish/100 ft segment at WC-5D). When comparing the 1998 to the 1997 densities, higher numbers were shown at four locations during the summer and fall periods (WC-2, WC-3, WC-5D, and WC-6). Densities at the other two sampling locations, WC-1R and WC-4D, were slightly lower in the summer of 1998 compared to the summer of 1997.

Table 3-6
Total Fish Density Comparisons (Number/100 Ft Segment)
in Willow Creek

Sampling Locations	June 1995	July 1997	June/July 1998	Oct 1995	Oct 1997	Oct 1998
WC-1R	94	87	79	61	70	109
WC-2	38	60	77	62	23	82
WC-3	29	40	73	52	44	90
WC-4	43	Not Sampled	Not Sampled	33	Not Sampled	Not Sampled
WC-4D	Not Sampled	50	47	Not Sampled	32	56
WC-5	45	Not Sampled	Not Sampled	49	Not Sampled	Not Sampled
WC-5D	Not Sampled	13	63	Not Sampled	9	25
WC-6	48	26	114	39	9	68

Annual and seasonal fluctuations in speckled dace and mountain sucker densities are shown in Figures 3-2 and 3-3. Since speckled dace usually was the most abundant species at the sampling locations, the density patterns for this species closely match those shown for the total fish densities.

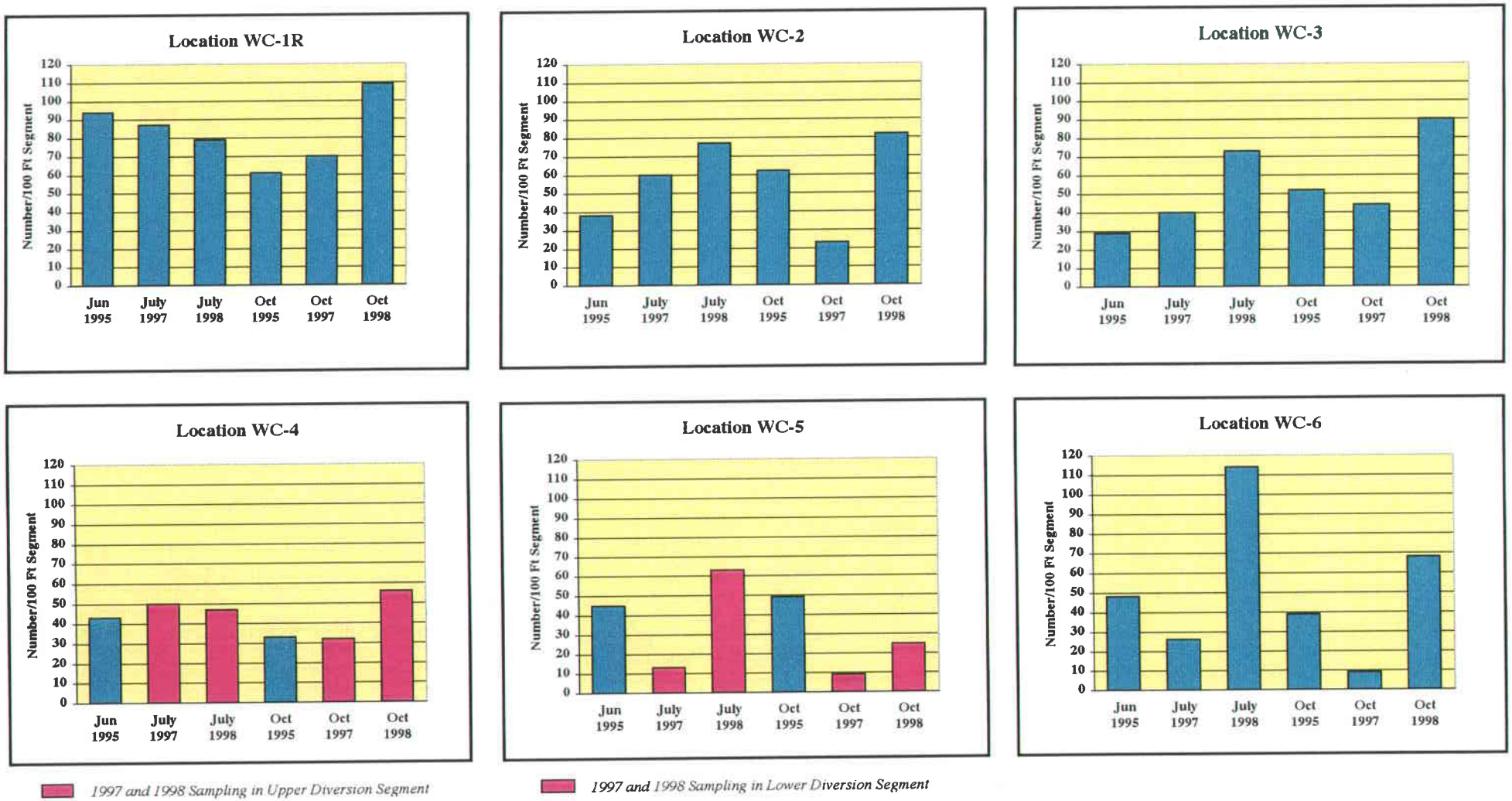


Figure 3-1
Fish Densities at Willow Creek Sampling Locations

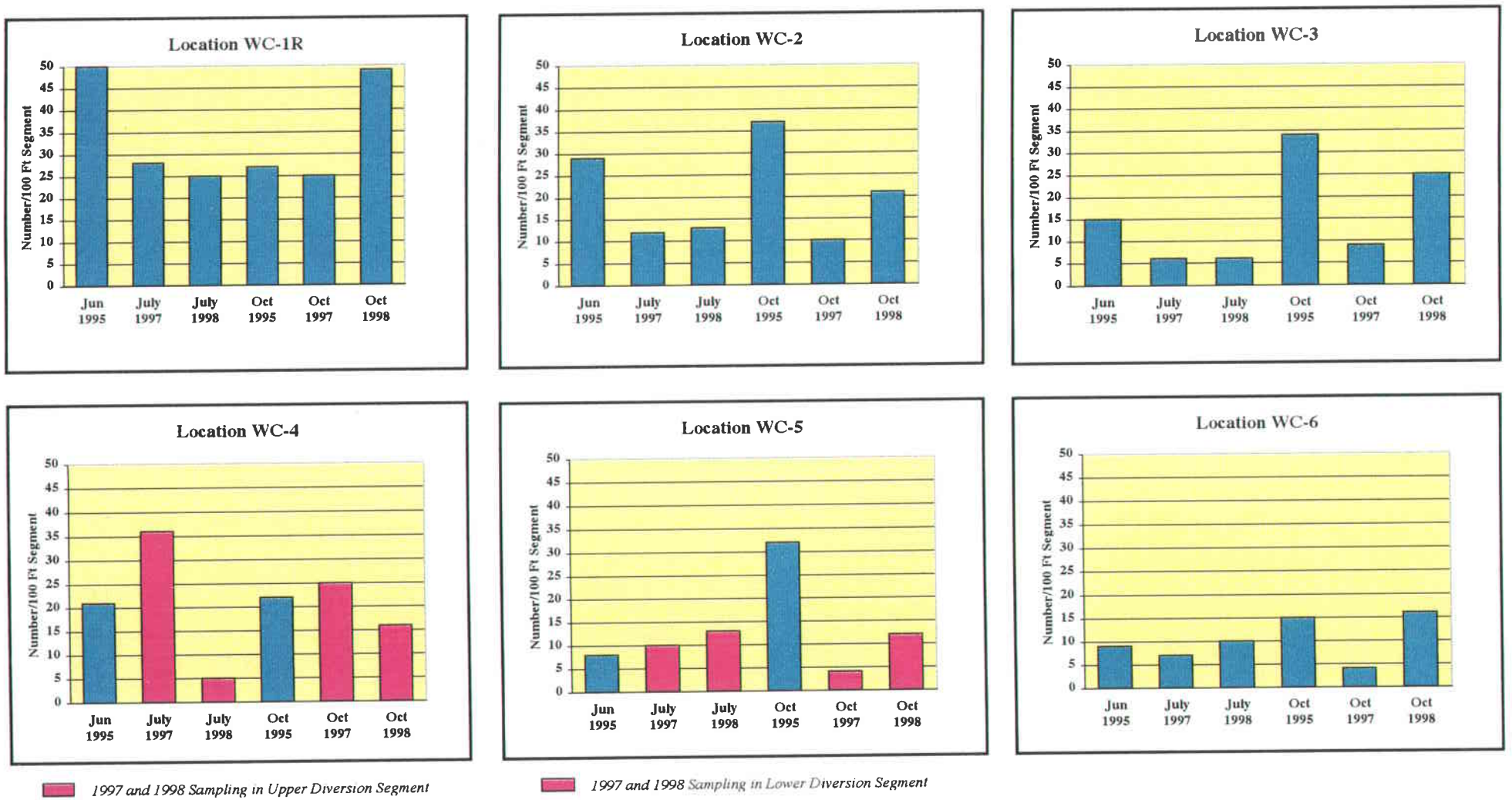


Figure 3-2
Mountain Sucker Densities at Willow Creek Sampling Locations

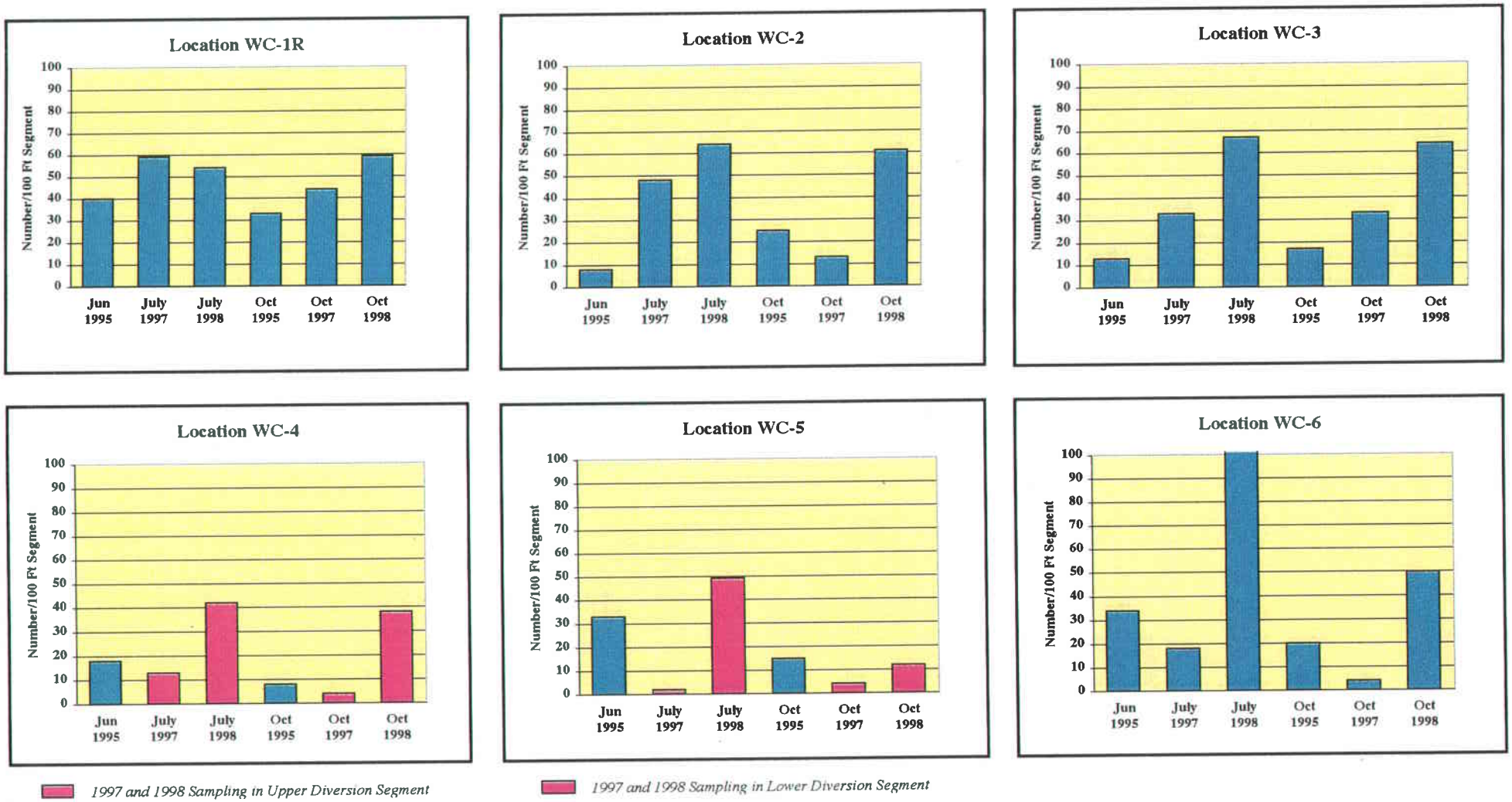


Figure 3-3
Speckled Dace Densities at Willow Creek Sampling Locations

3.3 RECOVERY STATUS IN THE DIVERSION SEGMENTS

Based on comparisons between fish densities and composition in 1998 and 1995, the fish community appeared to have recolonized the upper and lower diversion segments. Species composition and trout numbers were similar during pre- and post-diversion sampling efforts. In terms of total fish densities, the 1998 results at the upper diversion segment (WC-4D) were similar to summer densities and higher than the fall densities reported in 1995 (Figure 3-1). The lower diversion segment (WC-5D), which exhibited extremely low fish densities in 1997, showed an increase in total fish densities during both sampling efforts. The summer 1998 densities increased to the highest numbers observed in this section of the stream (63 in 1998 versus 13 in 1997 and 45 in 1995). The increase in fish numbers during the fall 1998 sampling effort was less pronounced (25 in 1998 versus 9 in 1997 and 49 in 1995). Since the 1998 fish densities were similar or higher than the 1995 densities during at least one sampling effort, it was concluded that recovery also had occurred at the lower diversion segment.

3.4 DISCUSSION

It is known that fish population densities can fluctuate considerably due to natural factors such as predation, disease, quality of habitat, and annual differences in spawning and hatching success (Sada 1990; Carter and Hubert 1995; Fausch and Bestgen 1997). Based on the baseline and monitoring studies that were conducted in Willow Creek, density differences varied from 2 to 3 times at some of the sampling locations. Although natural factors may have contributed to changes in Willow Creek fish densities, sufficient information was not available to evaluate the possible effects of these factors on the fish population.

A factor that likely contributed to reduced fish densities in the lower portion of Willow Creek in 1997 was the absence of flow. The periodic absence of surface flow from August 1996 through early March 1997 in the lower diversion segment and lower portion of Willow Creek downstream to the Price River likely contributed to the reduced fish densities at WC-5D and WC-6 in 1997. The flow reductions resulted in habitat loss for fish, particularly during the periods when the stream was dry. In addition, upstream fish movement into reaches represented by WC-6 was limited by low water levels in the lower portion of Willow Creek. Downstream movement was temporarily impeded beyond the lower portion of the upper diversion segment. After flow was restored in the lower diversion segment in March 1997, downstream fish movement resumed into the lower reaches of Willow Creek. The

combination of the temporary loss of habitat and impedance to fish movement in the fall and winter probably contributed to reduced fish numbers at WC-5D and WC-6.

Previous studies have shown that fish communities often recover from dry stream conditions within about one year (Canton et al. 1984; Meffe 1990; Bayley and Osborne 1993). The duration of recovery depends upon numerous factors such as the ecology of the fish species, types of aquatic habitat in the affected reaches, and extent of dry conditions. The duration of recovery in Willow Creek also took about one year, as indicated by similar or higher densities shown in the diversion segments and the furthest downstream location (WC-6) during the late June/early July 1998 survey.

It is important to clarify that recovery occurred even though the diversion segments exhibit different types of habitat in comparison to 1995. Riffles comprised 70 to 80 percent of the total area in the pre-diversion channel segments (WC-4 and WC-5) in 1995. Habitat in the new diversion segments consists of approximately 80 percent pools and 20 percent riffles. Although species such as speckled dace and mountain sucker prefer riffle habitats, their presence in the pool-dominated diversion segments indicates that they are able to utilize a variety of habitats (Sigler and Sigler 1996).

4.0 SUMMARY AND CONCLUSIONS

Based on comparisons between pre- and post-diversion population studies, the following summary and conclusions were made for fish communities.

- Willow Creek supports relatively low game fish densities, which are usually dominated by rainbow trout. The trout population exhibited similar densities and composition in both 1998, 1997, and 1995.

- Willow Creek supports relatively low numbers of native nongame fish populations that are dominated by speckled dace and mountain sucker. In 1998, speckled dace usually accounted for differences in total fish densities at the six sampling locations.

- Comparisons of density and composition data for pre- and post-diversion years indicated that fish populations have recolonized the diversion segments. At the upper diversion segment, the 1998 fish densities returned to similar or higher levels compared to 1995 during both sampling efforts. The lower diversion segment revealed higher densities during the summer sampling effort when comparing 1998 to 1995. The fall 1998 densities increased from the low levels observed in 1997, but levels were about one-half of the 1995 numbers. Since densities were similar or higher during at least one sampling effort, it was concluded that recovery also occurred at the lower diversion segment.

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Appendix A

Trout Length and Weight Data

Table A-1

Length (Millimeters) and Weight (Grams) Data for Trout Collected in Willow Creek, October 13 and 14, 1998

Species	WC-1R		WC-2		WC-3		WC-4D		WC-5D		WC-6		Qualitative	
	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight
Rainbow Trout	305	336			278	249	204	93			248	152	236	157
											196	90	255	146
													270	174
													240	137
													206	93
													194	82
													170	54
													170	62
Rainbow X Cutthroat Trout Hybrid									197	71				
Brown Trout							214	100						

Table A-2

Length (Millimeters) and Weight (Grams) Data for Trout Collected in Willow Creek, June 30 and July 1, 1998

Species	WC-1R		WC-2		WC-3		WC-4D		WC-5D		WC-6		Qualitative	
	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight	Length	Weight
Rainbow Trout									230	110	221	86	304	161
											235	113	288	145
													252	125
													230	118
													268	143

Appendix B

Results of Fish Population Surveys Conducted in 1997

Table B-1

Fish Population Survey Conducted in Willow Creek, July 22 and 23, 1997

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	1	1		0	0		1	0	
Juvenile	0	0		3	1		2	0	
Adult	13	6		7	1		3	0	
Total	14	7	28	10	2	12	6	0	6
Speckled dace									
YOY	2	0		0	1		0	5	
Juvenile	2	2		4	3		2	3	
Adult	19	12		8	5		12	0	
Total	23	14	59	12	9	48	14	8	33
Rainbow trout									
Adult	0	0	0	0	0	0	0	1	1
TOTAL FISH[1]	37	21	87	22	11	60	20	9	40

Species/Life Stage	WC-4D			WC-5D			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	1	0		0	0		1	0	
Juvenile	3	1		0	0		1	1	
Adult	2	5		7	2		4	0	
Total	6	6	36	7	2	10	6	1	7
Speckled dace									
YOY	0	0		0	0		1	0	
Juvenile	1	0		0	0		2	0	
Adult	5	3		2	0		9	4	
Total	6	3	13	2	0	2	12	4	18
Rainbow trout									
Adult	1	0	1	1	0	1	1	0	1
TOTAL FISH[1]	12	9	50	10	2	13	19	5	26

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

Table B-2
Fish Population Survey Conducted in Willow Creek, October 22, 1997

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		0	0	
Juvenile	0	0		0	0		3	0	
Adult	5	4		7	2		0	4	
Total	5	4	25	7	2	10	3	4	9
Speckled dace									
YOY	0	0		0	0		0	0	
Juvenile	1	1		0	0		0	0	
Adult	19	10		5	3		10	7	
Total	20	11	44	5	3	13	10	7	33
Rainbow trout									
Adult	1	0	1	0	0	0	2	0	2
TOTAL FISH[1]	26	15	70	12	5	23	15	11	44

Species/Life Stage	WC-4D			WC-5D			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
YOY	0	0		0	0		0	0	
Juvenile	1	0		1	1		0	1	
Adult	4	6		1	0		2	0	
Total	5	6	25	2	1	4	2	1	4
Speckled dace									
YOY	1	0		0	1		0	2	
Juvenile	0	0		1	0		0	0	
Adult	1	1		1	0		2	0	
Total	2	1	4	2	1	4	2	2	4
Rainbow trout									
Juvenile	1	0		0	0		0	0	
Adult	1	0		1	0		1	0	
Total	2	0	2	1	0	1	1	0	1
Cutthroat/Rainbow Hybrid									
Adult	1	0	1	0	0	0	0	0	0
TOTAL FISH[1]	10	7	32	5	2	9	5	3	9

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

Appendix C

Results of Fish Population Surveys Conducted in 1995

Table C-1

Fish Population Survey Conducted in Willow Creek, June 28 and 29, 1995

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
Juvenile	3	2		3	4		6	1	
Adult	17	10		15	3		5	2	
Total	20	12	50	18	7	29	11	3	15
Bluehead sucker									
Adult	4	0	4	0	1	1	0	0	0
Speckled dace									
Juvenile	2	1		0	0		1	1	
Adult	7	6		4	2		7	2	
Total	9	7	40	4	2	8	8	3	13
Redside shiner									
Adult	0	0	0	0	0	0	0	0	0
Rainbow trout									
Adult	0	0	0	0	0	0	1	0	1
TOTAL FISH[1]	33	19	94	22	10	38	20	6	29

Species/Life Stage	WC-4			WC-5			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
Juvenile	3	3		0	0		0	0	
Adult	9	2		5	2		3	2	
Total	12	5	21	5	2	8	3	2	9
Bluehead sucker									
Adult	3	0	3	0	0	0	0	0	0
Speckled dace									
Juvenile	0	0		0	0		0	0	
Adult	16	2		14	8		21	8	
Total	16	2	18	14	8	33	21	8	34
Redside shiner									
Adult	1	0	1	1	0	1	5	0	5
Rainbow trout									
Adult	0	0	0	3	0	3	0	0	0
TOTAL FISH[1]	32	7	43	23	10	45	29	10	48

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

Table C-2

Fish Population Survey Conducted in Willow Creek, October 9 and 10, 1995

Species/Life Stage	WC-1R			WC-2			WC-3		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
Juvenile	9	1		14	5		18	6	
Adult	11	4		7	4		3	2	
Total	20	5	27	21	9	37	21	8	34
Redside shiner									
Adult	0	0	0	0	0	0	0	0	0
Speckled dace									
Juvenile	5	1		1	0		4	1	
Adult	5	6		4	4		11	1	
Total	10	7	33	5	4	25	15	2	17
Cutthroat trout									
Adult	0	0	0	0	0	0	0	0	0
Rainbow trout									
Adult	1	0	1	0	0	0	1	0	1
TOTAL FISH[1]	31	12	61	26	13	62	37	10	52

Species/Life Stage	WC-4			WC-5			WC-6		
	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.	1st	2nd	No./100 Ft.
Mountain sucker									
Juvenile	9	4		9	4		4	1	
Adult	6	1		8	4		9	1	
Total	15	5	22	17	8	32	13	2	15
Redside shiner									
Adult	0	0	0	0	0	0	1	0	1
Speckled dace									
Juvenile	3	2		12	1		14	2	
Adult	1	0		1	1		1	2	
Total	4	2	8	13	2	15	15	4	20
Cutthroat trout									
Adult	0	0	0	1	0	1	0	0	0
Rainbow trout									
Adult	3	0	3	1	0	1	3	0	3
TOTAL FISH[1]	22	7	33	32	10	49	32	6	39

[1]Total fish/100 ft segment was calculated by summing the population estimates for each species.

WILLOW CREEK STREAM RECLAMATION

During the fall of 1998, approximately 6000 square feet of the Willow Creek stream channel was reseeded with the Division approved seed mix (upland mix). The reseeding activity was performed to augment the existing vegetation and promote vegetation success in an attempt to eliminate as much cheatgrass as possible and establish desirable vegetation.

All worked performed by Cyprus during this time was at least overseen or directed by DOGM's Reclamation Specialist, Mr. Paul Baker. Reseeding was performed on the west side of the lower part of the relocated stream from the culvert to the guard rail at the sediment pond emergency spillway. The intended work was to gouge the area, seed it, and mulch with straw and wood fiber. However, the trackhoe was not able to reach the entire area, but it was able to get most of it.

During the initial gouging, it was discovered that the area has riprap under a few inches of soil, so deep gouging was not possible. The soil was dug up as much as possible, but this still didn't allow the cheatgrass to be completely dug up and buried. Nevertheless, it was Mr. Baker's opinion that enough open spaces were created for the desirable vegetation to become established.

The area will continue to be monitored and should the need arise additional reseeding will take place, and if reseeding is not effective then an approved herbicide will be strategically applied to reduce the presence of cheatgrass and minimize the impact to the desirable vegetation.

Also during the fall, approximately 700 coyote willow cuttings were transplanted along the relocated segments of the stream, with the majority of the cuttings being placed along the lower relocated segment. Narrow leaf cottonwood plantings were not planted due to the unavailability of the species.

For 1999, CPMC intends of transplanting an additional 300 coyote willows and approximately 200 narrow leaf cottonwoods. Additionally, if the Division determines that a herbicide should be used to minimize the cheatgrass, then it will be applied during the Fall of 1999, or in the early Spring of 2000, followed by the appropriate reseeding activities. CPMC will continue to monitor the vegetation success to ensure compliance with the operating permits.

One item that needs noting is that it appears that all of the narrow leaf cottonwood pole plantings placed following the completion of the stream relocation did not survive.