

Chadwick Ecological Consultants, Inc., 2003

Red River aquatic biological monitoring

2002

Appendices A-D

Prepared for Molycorp, Inc.

**APPENDIX A**

**Fish Length-Frequency Histograms**

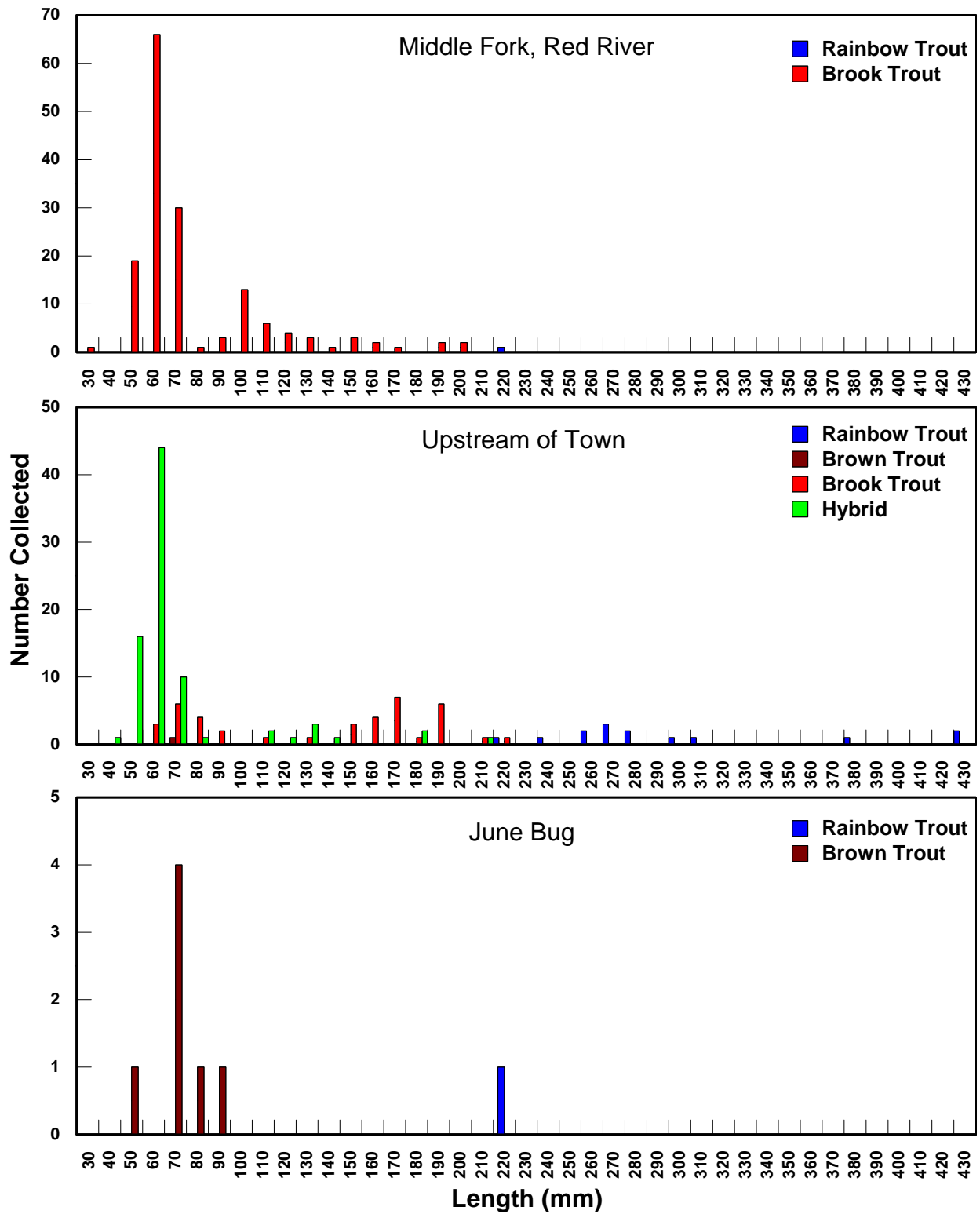


FIGURE A-1: Length frequency histograms of trout collected in the Red River and tributaries in fall 2002.

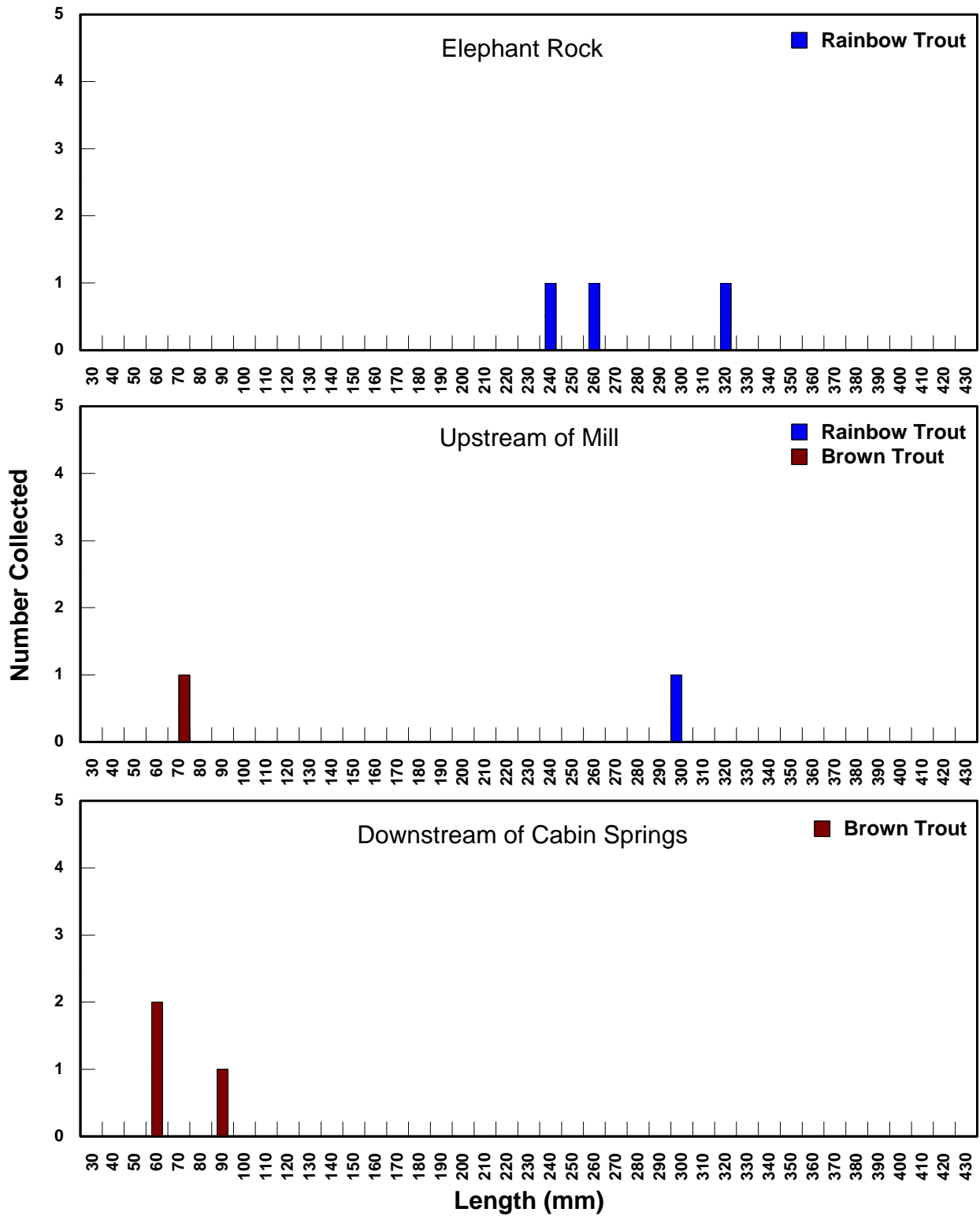


FIGURE A-1: Continued.

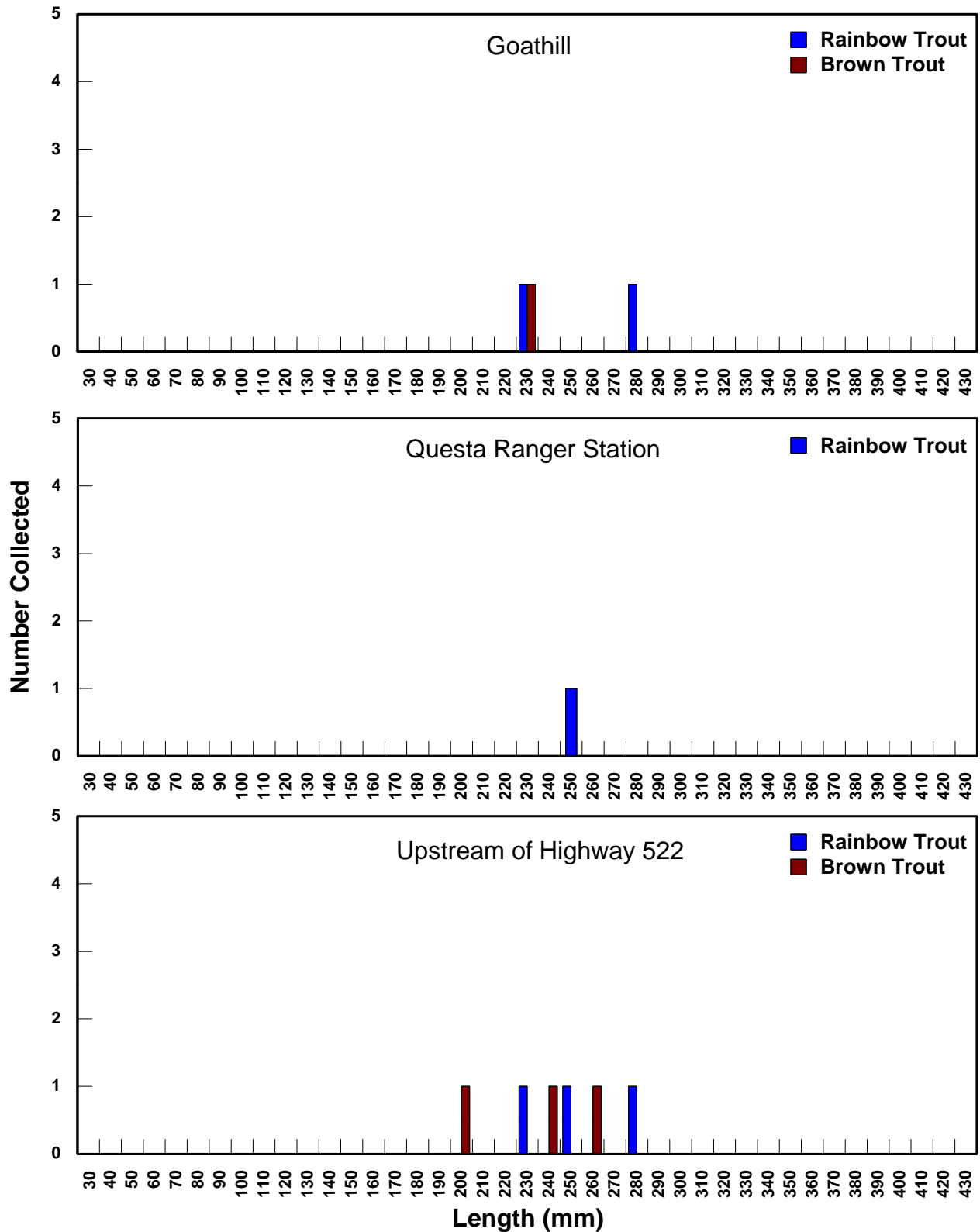


FIGURE A-1: Continued.

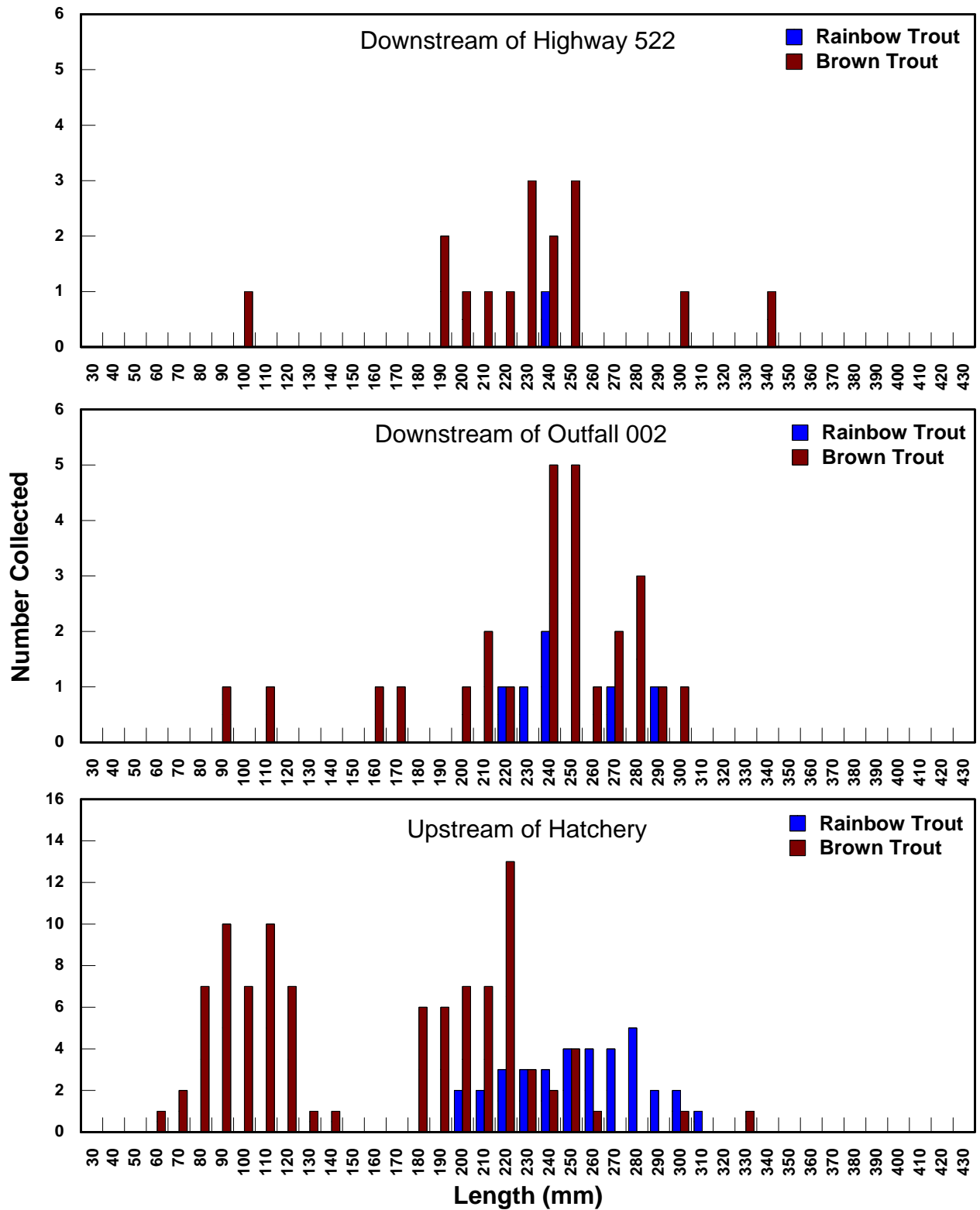


FIGURE A-1: Continued.

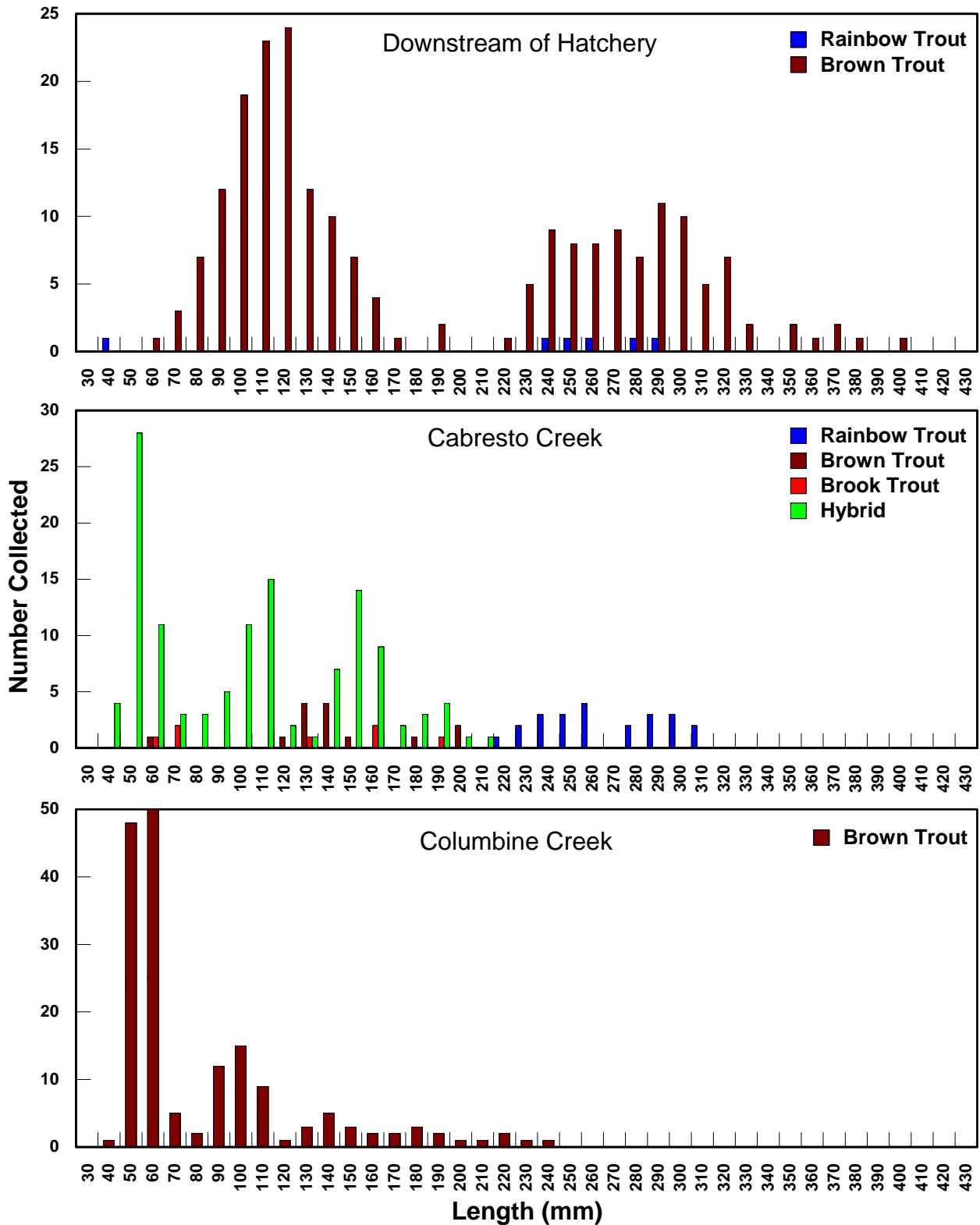


FIGURE A-1: Continued.

**APPENDIX B**

**Fish Tissue Data**



**TABLE B-1:** Summary of number of fish targeted for collection at each study site and the number of fish actually collected in fall 2002.

Site	Brown trout < 8"		Brown trout > 8"		White sucker	
	Target	Actual	Target	Actual	Target	Actual
<u>Reference Sites</u>						
Cabresto Creek	3	3	3	3	--	--
Upstream of Town	3	3	3	3	--	--
<u>Red River Downstream of Town</u>						
June Bug	3	0	3	2	--	--
Elephant Rock	3	0	3	0	--	--
Downstream of Hansen	3	0	3	0	--	--
Upstream of Mill	3	0	3	0	--	--
Upstream of Columbine	3	0	3	0	--	--
Downstream of Cabin Springs	3	0	3	2	--	--
Goathill	3	0	3	2	--	--
Questa Ranger Station	3	0	3	2	--	--
Upstream of Highway 522	3	3	3	3	--	--
Downstream of Highway 522	3	3	3	3	--	--
Downstream of Outfall 002	3	3	3	3	--	--
Upstream of Hatchery	3	3	3	3	--	--
<u>Lakes</u>						
Upper Fawn Lake	3	0	3	2	3	3
Eagle Rock Lake	3	0	3	0	3	3

**TABLE B-2:** Metals concentrations (mg/kg wet weight) in whole-body large (>8 in) brown trout collected from the study sites, fall 2002. < = all values below detection limit.

Site	Al	As	Cd	Cu	Pb	Hg	Ni	Zn
<u>Reference Sites</u>								
Cabresto Creek	17.2	<0.08	0.02	1.93	0.05	0.018	<0.50	33.9
Upstream of Town	8.2	<0.08	0.02	1.76	<0.04	<0.008	<0.49	29.8
<u>Red River Downstream of Town</u>								
June Bug	20.9	<0.08	0.19	6.21	<0.04	<0.008	<0.51	35.7
Downstream of Cabin Springs	12.9	0.14	0.08	1.84	<0.04	0.009	<0.52	23.1
Goathill	21.7	0.11	0.21	<0.19	<0.04	0.015	<0.48	44.6
Questa Ranger Station	27.9	0.21	0.29	7.84	<0.04	0.013	<0.55	42.3
Upstream of Highway 522	23.2	<0.08	0.26	0.90	0.05	<0.008	<0.49	63.9
Downstream of Highway 522	<1.0	<0.08	0.17	5.09	<0.04	<0.008	<0.12	41.6
Downstream of Outfall 002	45.7	<0.08	0.17	4.28	<0.04	0.015	0.26	39.1
Upstream of Hatchery	26.6	<0.08	0.17	4.54	<0.04	<0.008	0.29	41.5
<u>Lakes</u>								
Upper Fawn Lake	119.7	<0.07	0.02	1.40	<0.04	<0.008	<0.49	29.3

**TABLE B-3:** Metals concentrations (mg/kg wet weight) in whole-body small (<8 in) brown trout collected from the study sites, fall 2002. < = all values below detection limit.

Site	Al	As	Cd	Cu	Pb	Hg	Ni	Zn
<u>Reference Sites</u>								
Cabresto Creek	45.0	<0.08	<0.01	1.13	<0.04	0.013	<0.49	44.0
Upstream of Town	23.3	<0.07	0.02	1.21	<0.04	<0.008	<0.50	33.3
<u>Red River Downstream of Town</u>								
Upstream of Highway 522	29.2	<0.08	0.27	4.67	0.24	<0.008	<0.53	53.3
Downstream of Highway 522	57.3	<0.07	0.30	3.50	<0.04	<0.008	0.18	57.1
Downstream of Outfall 002	36.7	<0.08	0.10	2.40	0.17	<0.008	<0.53	39.7
Upstream of Hatchery	39.7	<0.08	0.11	2.27	<0.04	<0.008	0.17	50.1

**TABLE B-4:** Metals concentrations (mg/kg wet weight) in whole body white suckers collected from Upper Fawn Lake and Eagle Rock Lake, fall 2002. < = all values below detection limit.

Site	Al	As	Cd	Cu	Pb	Hg	Ni	Zn
Upper Fawn Lake	20.5	<0.15	0.04	1.04	<0.07	0.011	<0.91	22.8
Eagle Rock Lake	177.0	<0.16	0.11	1.70	1.02	<0.016	<1.00	29.4

## **APPENDIX C**

### **Benthic Invertebrate Tissue Data**

**TABLE C-1:** Metals concentrations (mg/kg wet weight) in composite benthic macroinvertebrates samples from the study sites, spring 2002. < = less than detection limit.

Sites	Al	As	Cd	Cu	Pb	Ni	Zn
			<u>Reference Sites</u>				
Middle Fork	193	0.50	0.14	4.7	<2.0	<0.5	24.3
Upstream of Town	82	0.2	0.07	3.7	<2.0	<0.5	27.1
			<u>Red River Downstream of Town</u>				
June Bug	481	0.5	1.68	53.0	<2.0	3.6	132.0
Elephant Rock	400	0.3	1.71	26.2	3.0	4.7	146.0
Downstream of Hansen Creek	770	0.2	1.17	21.7	<2.0	2.7	152.0
Upstream of Columbine	507	0.2	2.21	20.1	<2.0	6.1	235.0
Goathill	700	0.3	1.27	18.5	<2.0	3.5	118.0
Questa Ranger Station	1,950	0.1	0.51	38.4	<2.0	3.3	91.0
Downstream of Highway 522	1,510	0.2	2.27	33.2	<2.0	4.9	255.0
Upstream of Hatchery	790	0.5	1.62	17.5	<2.0	7.1	137.0
Downstream of Hatchery	986	0.3	2.84	23.4	<2.0	6.4	306.0

**TABLE C-2:** Metals concentrations (mg/kg wet weight) in composite benthic macroinvertebrates samples from the study sites, fall 2002. < = less than detection limit.

Sites	Al	As	Cd	Cu	Pb	Ni	Zn
<u>Reference Sites</u>							
Cabresto Creek	152	0.14	0.17	3.7	1.2	<0.6	85.7
Upstream of Town	467	0.27	0.14	6.8	0.6	1.4	39.1
<u>Red River Downstream of Town</u>							
June Bug	281	0.25	1.10	17.5	1.6	2.9	95.2
Elephant Rock	276	<0.21	1.20	16.0	3.7	4.4	94.7
Downstream of Hansen Creek	329	<0.18	0.60	13.0	2.4	3.1	78.6
Upstream of Mill	371	<0.09	1.10	13.8	2.5	2.8	132.0
Upstream of Columbine	277	<0.08	0.27	10.0	2.2	2.2	41.0
Downstream of Cabin Springs	474	<0.13	0.41	12.6	3.2	3.7	56.2
Goathill	259	<0.14	0.35	9.9	1.7	2.6	48.5
Questa Ranger Station	655	<0.15	0.63	18.0	1.3	2.4	77.9
Upstream of Highway 522	606	0.26	0.87	11.0	3.2	3.1	113.0
Downstream of Highway 522	590	0.27	0.95	12.8	3.9	3.1	99.6
Downstream of Outfall 002	586	0.52	0.49	14.5	3.5	2.8	69.5
Upstream of Hatchery	787	0.88	0.31	12.9	4.7	5.5	66.3
<u>Lakes</u>							
Upper Fawn Lake	72	0.43	0.30	16.4	1.1	0.3	14.7
Eagle Rock Lake	589	0.42	1.30	22.7	2.5	6.3	74.9

## **APPENDIX D**

### **Bryophyte and Algae Tissue Data**

**TABLE D-1:** Metals concentrations (mg/kg wet weight) in aquatic bryophyte samples from the study sites, fall 2002. < = values below detection limit.

Sites	Al	As	Cd	Cu	Pb	Ni	Zn
			<u>Reference Sites</u>				
Cabresto	753	0.42	0.15	1.8	5.8	2.9	45
Upstream of Town	1,120	0.21	<0.01	3.2	1.2	1.8	11
			<u>Red River Downstream of Town</u>				
June Bug	1,360	0.48	1.90	72.0	6.0	30.9	226
Elephant Rock	652	<0.08	0.49	27.3	7.3	11.2	65
Downstream of Hansen Creek	2,110	<0.09	0.29	34.1	18.2	10.5	59
Upstream of Mill	541	<0.08	0.17	11.4	2.6	6.2	29
Upstream of Columbine	1,790	<0.08	0.50	30.6	12.7	18.2	91
Downstream of Cabin Springs	3,220	<0.07	1.70	56.4	9.8	25.3	222
Goathill	3,865	2.90	0.75	48.7	27.3	26.1	185
Questa Ranger Station	3,370	<0.07	0.38	54.4	7.5	11.1	106
Upstream of Highway 522	5,270	2.00	2.60	81.4	24.3	61.6	547
Downstream of Highway 522	2,570	1.10	0.88	53.2	13.3	22.7	157
Downstream of Outfall 002	3,310	1.40	1.60	76.3	17.0	31.2	224
Upstream of Hatchery	3,000	2.20	1.70	49.4	19.0	41.3	228

**TABLE D-2:** Metals concentrations (mg/kg wet weight) in algae from the lakes in the study area. < = values below detection limit.

Sites	Al	As	Cd	Cu	Pb	Ni	Zn
				<u>Algae</u>			
Upper Fawn Lake	747	0.64	0.56	15.5	11.6	14.6	74
Eagle Rock Lake	6,840	2.00	1.70	61.4	31.3	41.0	372