

**Bonneville cutthroat trout (*Oncorhynchus  
clarki utah*) surveys in the Chalk Creek  
(sections 02-03) Drainage, 1998-1999**

by

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## INTRODUCTION

The metapopulation of Bonneville cutthroat trout (*Oncorhynchus clarki utah*) within the Chalk Creek Drainage is extensive. In fact, this drainage contains one of the strongest and largest natural metapopulations within the Bonneville cutthroat trouts' historic range. Little information with regards to Bonneville cutthroat trout distribution was known in the Chalk Creek Drainage until stream surveys were completed in 1998-1999.

The surveys completed in 1998-1999 included tributary streams that contained fish and the mainstem, upstream from the diversion barrier, which is located approximately 4 kilometers upstream from the town of Coalville, Utah. These surveys were extensive and provides a complete picture on the entire metapopulation of Bonneville cutthroat trout in this system. The 1998-1999 surveys provided needed data that will help towards the objectives of long term conservation of Bonneville cutthroat trout in Utah (Lentsch et al. 1997). This information will be included in the revision of the Bonneville cutthroat trout Conservation Strategy in Utah (Lentsch et al. 1997).

The **Goal** of the 1998-1999 surveys were to document the extent of the Bonneville cutthroat trout metapopulation in the Chalk Creek Drainage.

More specifically, the **Objectives** for these surveys were:

- 1) to quantify the extent (number of stream kilometers) that Bonneville cutthroat trout occupy during base flow conditions in the Chalk Creek Drainage, and
- 2) to quantify the genetic integrity of the Bonneville cutthroat trout in the Chalk Creek Drainage.

Results related to Objective 1 will be discussed within this document. Objective 2 will be addressed during the next several years as the genetic tissue samples of Bonneville cutthroat trout collected in 1998-1999 are processed with nuclear DNA, mitochondrial DNA, and meristic analyses.

## METHODS

All stream surveys were completed during base flow conditions in July to determine the extent of the resident Bonneville cutthroat trout populations in each stream/stream section. When possible, stream survey locations were chosen as closely to previous Utah Division of Wildlife Resources (UDWR) survey locations and some tributary stations were chosen to maximize information on the cutthroat trout distribution within the target tributary streams. In general, surveys began on tributary streams lower in the Chalk Creek drainage and continued upstream. Seventeen days were required to complete the surveys.

Universal Transverse Mercator (UTM) coordinates were recorded for each stream survey location with a hand-held Global Positioning System (GPS). Habitat Quality Index (HQI) attributes were collected for Model II according to Binns (1982). HQI attributes were collected only in streams containing cutthroat trout. All captured fish were transferred to live cages placed in the stream. Fish collected from the first electrofishing pass were kept separate from the fish collected from the second electrofishing pass. Fish processing and data collection commenced immediately following electrofishing completion and fish not collected for genetic analysis were returned to the water downstream of the station. All fish captured were measured to the nearest millimeter (mm) TL and weighed to the nearest gram (g).

A modified Zippin multiple pass depletion electrofishing formula was used to calculate the population estimates and ninety-five percent confidence limits for each site surveyed (Zippin 1958). The formulas used to calculate the estimates were:

$$N = C_1^2 / C_1 - C_2$$

where,

N = estimated fish population,

C<sub>1</sub> = the number of fish captured from the first pass, and

C<sub>2</sub> = the number of fish captured on the second pass.

$$SE = [C_1 * C_2 / (C_1 - C_2)^2] * (C_1 + C_2)^{1/2}$$

$$95\% \text{ C.I.} = 2 * SE$$

Population estimates were calculated separately for age-1 and older fish and age-0 fish because smaller fish are not immobilized as effectively as larger fish while electrofishing (Reynolds 1989) and consequently, population estimates for age-0

fish are usually not as meaningful. Because most sampling was completed in July before age-0 cutthroat trout have emerged from gravels, the only stream that contained age-0 cutthroat trout was Fish Creek, which was sampled in September. Age-0 fish sampled in this stream were determined from a length frequency histogram with 10 mm increments.

Condition factor (Ktl) was calculated using the formula:

$$K = W * 100,000/L^3$$

where,

W = weight in g, and

L = TL in mm.

All cutthroat trout tissue samples were collected for genetic analysis according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office of the UDWR during the winter/spring of 2000. Samples will be processed with nuclear DNA and mitochondrial DNA. Anticipated completion of these samples is 2002. Meristic analyses will be completed by 2001 at the UDWR office located in Salt Lake City.

#### **Surveys on Chalk Creek section 02**

Each sample site was as close to 200 m in length as possible. Sites were measured using a laser range finder. No upstream or downstream block net was used, however, a natural break in the stream (e.g., riffle) was chosen to be the upstream barrier.

Sampling was conducted using a two-pass depletion technique. For both electrofishing passes, a canoe with a generator and Coffelt C-Phase VVP set to 300-400 V was pulled slowly upstream with four hand held anodes. The cathode was attached to the canoe. Each person with an anode used a dip net to collect stunned fish. Additional netting personnel in the electrified area also collected stunned fish and transferred them from the other personnel to a holding container. Ten personnel were used on these surveys.

#### **Surveys on Chalk Creek section 03 and tributaries**

A 100 m reach, representing habitat conditions throughout the entire stream, was identified for each survey. Stations were measured using a 100 m tape. On tributaries where foot access of less than 1 km was required, a block net was placed at the lower and upper end of the reach. On tributaries where foot access of

more than 1 km was required, a natural habitat break (e.g., small waterfall) was chosen for the upper end of the reach and when possible, the lower end as well. A single battery-powered backpack electrofishing unit, manufactured by Smith Root, was used for all tributary surveys and the highest survey completed on Chalk Creek section 03. Two electrofishing units were used on the low and medium stations on Chalk Creek section 03. Between 3 and 4 personnel were utilized on these surveys. Electrofishing settings varied depending on the stream conductivity. In general, the pulse was set at J (70 Hz), the frequency was set at 4 (4 ms), and the voltage was set at 400 V.

## RESULTS

Fish populations in the Chalk Creek Drainage were sampled to: 1) determine the distribution of Bonneville cutthroat trout in the drainage and 2) collect Bonneville cutthroat trout tissue for genetic analyses. At least one complete two-pass depletion electrofishing survey was completed on the following streams: Chalk Creek section 02, Chalk Creek section 03, South Fork of Chalk Creek, Elkhorn Canyon, Lodgepole Creek, Fish Creek, IVAP230D06, IVAP230D09, Huff Creek, East Fork of Chalk Creek, IVAP230M02, Middle Fork, Mill Fork, IVAP230M01B02, Red Hole, IVAP230S, and IVAP230S01 (Table 1; Figure 1).

Twenty-five stream surveys were completed on 17 streams/stream sections in the Chalk Creek Drainage that contained cutthroat trout (Table 1; Figure 1). Based on these 25 stream surveys, Bonneville cutthroat trout occupy approximately 167 stream kilometers (103 stream miles) in the Chalk Creek (Table 1). Three additional streams were surveyed and other native fish species than cutthroat trout were found (Figure 1). Six additional streams/canyons were examined and determined that flows were not conducive to a resident fish population.

Fish species caught during 1998-1999 stream surveys in the Chalk Creek Drainage included: Bonneville cutthroat trout (BCT), brook trout (BKT; *Salvelinus fontinalis*) mountain sucker (MTS; *Catostomus platyrhincus*), mottled sculpin (MSC, *Cottus bairdi*), Utah Sucker (UTS; *Catostomus ardens*), redbside shiner (RSS; *Richardsonius balteatus hydrophlox*), speckled dace (SPDC; *Rhinichthys osculus*), and longnose dace (LNDC; *Rhinichthys cataractae*).

Table 1. Streams/stream sections containing cutthroat trout during 1998-1999 surveys in the Chalk Creek Drainage.

Stream/Section	Approximate # of stream km occupied (# stream miles occupied)	# of >age-1 cutthroat/km (#/mile)
Chalk Creek section 02 (low)	26.5 (16.5)	100*(161)
Chalk Creek section 02 (high)		178(287)
South Fork Chalk Creek (low)	24.9 (15.5)	185(298)
South Fork Chalk Creek (high)		426(685)
Elkhorn Canyon	9.7 (6)	60(97)
Lodgepole Creek	0.8 (0.5)	131(211)
Fish Creek	12.9 (8)	1009(1623)
IVAP230D06	4 (2.5)	80(129)
IVAP230D09	2.4 (1.5)	107(172)
Huff Creek (low)	14.5 (9)	173(279)
Huff Creek (high)		418(673)
East Fork Chalk Creek (low)	16.1 (10)	183(294)
East Fork Chalk Creek (high)		310(499)
IVAP230M02	1.6 (1)	272(437)
Middle Fork (low)	8.8 (5.5)	154(247)
Middle Fork (high)		10(16)
Red Hole (low)	1.6 (1)	40(64)
Red Hole (high)		20(32)
Mill Fork	7.2 (4.5)	143(230)
IVAP230M01B02	3.2 (2)	180(290)
Chalk Creek section 03 (low)	27.4 (17)	40(64)
Chalk Creek section 03 (medium)		39(62)
Chalk Creek section 03 (high)		774(1245)
IVAP230S	5.6 (3.5)	70(113)
IVAP230S01		120(193)
Total	167.2 (103)	

\* Based on the actual number caught.

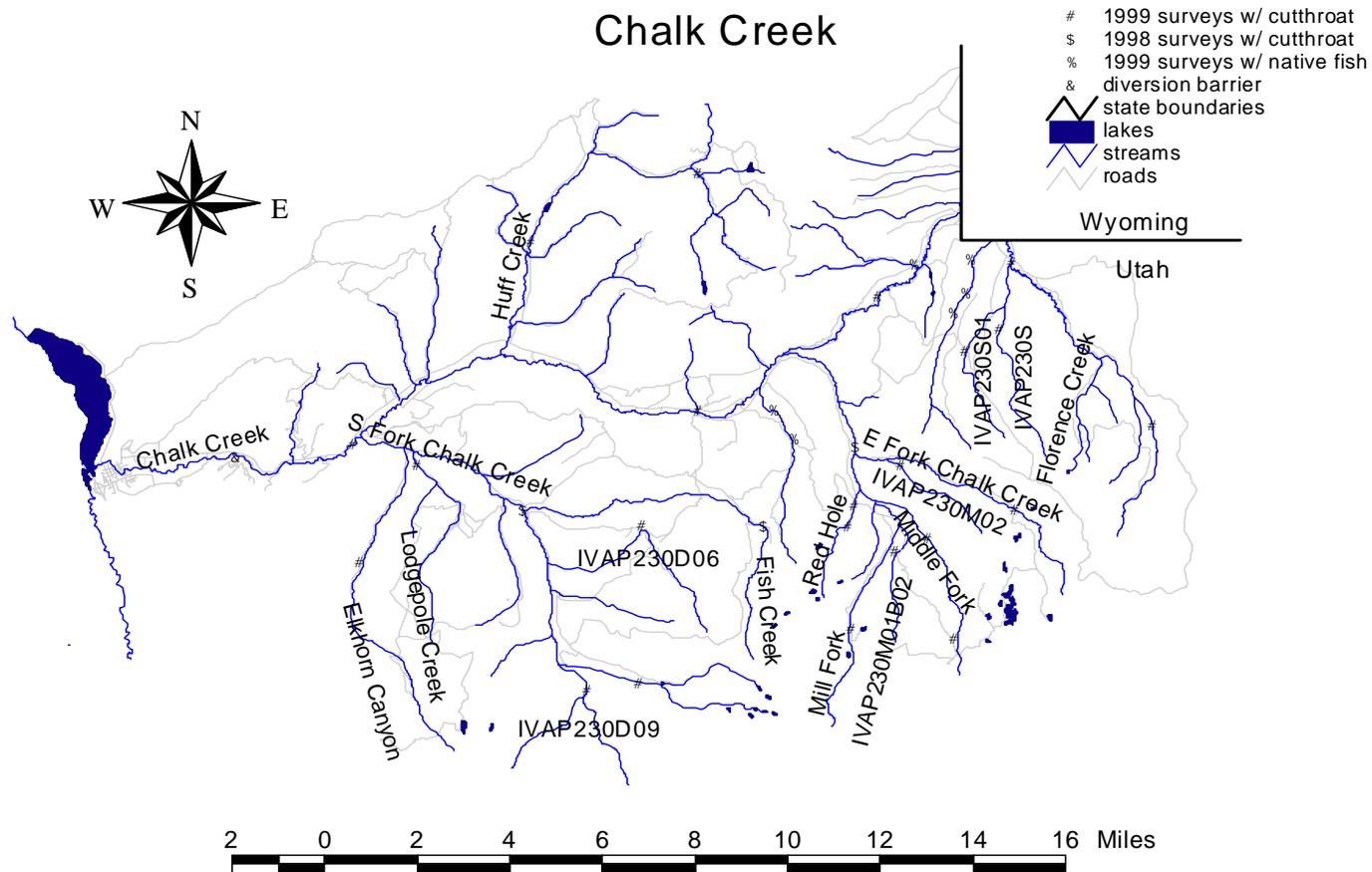


Figure 1. Stream surveys that contained Bonneville cutthroat trout in the Chalk Creek Drainage, 1998-1999.

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## Chalk Creek section 02

IVAP230 02

Chalk Creek section 02 (diversion barrier upstream to the East Fork of Chalk Creek) is a major tributary to the Weber River. Chalk Creek section 02 is in Summit County (Coalville, Turner Hollow, Upton, and Red Hole USGS Quads) with the entire drainage being private. Fish species present in Chalk Creek section 02 are Bonneville cutthroat trout, mottled sculpin, longnose dace, speckled dace, mountain sucker, Utah sucker, and redbreast shiner. Between 500-1,000 rainbow trout catchables were stocked annually at bridge crossings in Chalk Creek until 1998, consequently, rainbow trout may be present in this section. Despite the stocking history in the drainage, all trout caught in 1997 and 1999 phenotypically looked like Bonneville cutthroat trout. A diversion barrier (Figure 2), located 5.5 km below the 1999 low station is preventing the upstream movement of rainbow trout and brown trout from the lower reaches of Chalk Creek and Echo Reservoir. This barrier protects the Chalk Creek Drainage. Chalk Creek section 02 is a class IVB fishery for Bonneville cutthroat trout.

### Low

The stream survey in Chalk Creek section 02 was completed on August 3, 1999. The station was located approximately 400 m downstream from the confluence with the South Fork of Chalk Creek. UTM coordinates for this station were: 4530552N and 0475043E. The length of the electrofished station was 190 m.

Two-pass electrofishing resulted in the capture of 19 age-1 and older Bonneville cutthroat trout (Table 2; Figure 3), 17 mountain sucker ( $426 \pm 3063$ /stream km [ $686 \pm 4929$ /stream mile]), 19 Utah sucker ( $127 \pm 75$ /stream km [ $205 \pm 120$ /stream mile]), 19 speckled dace ( $526 \pm 4048$ /stream km [ $847 \pm 6513$ /stream mile]), and 2 longnose dace ( $11 \pm 0$ /stream km [ $17 \pm 0$ /stream mile]). More cutthroat trout were caught on the second electrofishing pass than the first pass, consequently a population estimate was not available. A population estimate, assuming that all cutthroat trout were caught in the 190 m reach, yields 100 cutthroat trout/stream km (161/stream mile; 203 kg/ha; 184 lb/acre) (Table 2). The HQI predicted a lower trout biomass (72 kg/ha; 64 lb/acre) with cover and macro invertebrates being the limiting factors. Twenty-two cutthroat trout (10 whole, 12 fin clips) were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000.

Chalk Creek section 02 (low) had been surveyed three times before by the UDWR. In 1997, three-pass electrofishing in the same station sampled in 1999 resulted in the capture of 17 age-1 and

older Bonneville cutthroat trout (Table 2), 55 mountain sucker, 34 mottled sculpin, 48 dace (speckled and longnose), 29 redbside shiner ( $605 \pm 2157/\text{stream km}$ ;  $974 \pm 3470/\text{stream mile}$ ), and 36 Utah sucker ( $362 \pm 10/\text{stream km}$ ;  $582 \pm 16/\text{stream mile}$ ). Population estimates were only available for redbside shiner and Utah sucker because more fish were caught on the second or third electrofishing passes than during the first pass for the other species. A population estimate, assuming that all cutthroat trout were caught, yields 89 cutthroat trout/stream km ( $144/\text{stream mile}$ ) (Table 2). The population estimate for redbside shiner is likely high because of similar catches for all three passes (11 - 1st pass, 9 - 2nd pass, and 9 - 3rd pass). All of the dace were initially classified as speckled dace, however, some question existed with their identification and some were likely longnose dace. In 1991, two pass electrofishing in a 161 m station produced 7 Bonneville cutthroat trout ( $44 \pm 0/\text{stream km}$ ;  $70 \pm 0/\text{stream mile}$ ; Table 2), 355 dace ( $4216 \pm 1654/\text{stream km}$ ;  $6784 \pm 2662/\text{stream mile}$ ), 86 mottled sculpin ( $873 \pm 492/\text{stream km}$ ;  $1404 \pm 792/\text{stream mile}$ ), 98 suckers (Utah and mountain;  $820 \pm 255/\text{stream km}$ ;  $1320 \pm 410/\text{stream mile}$ ), and 76 redbside shiner ( $1370 \pm 2362/\text{stream km}$ ;  $2205 \pm 3801/\text{stream mile}$ ). In 1970, one-pass electrofishing in a 161 m station produced 2 Bonneville cutthroat trout ( $12/\text{stream km}$ ;  $20/\text{stream mile}$ ; Table 2), 1 rainbow trout ( $6/\text{stream km}$ ;  $10/\text{stream mile}$ ), mottled sculpin of all sizes, and suckers (Utah and mountain) were abundant.

The Bonneville cutthroat trout population in Chalk Creek section 02 near the South Fork of Chalk Creek confluence appears to be maintaining at a modest level of adult fish (Table 2). The absence of smaller age classes in this portion of stream indicates that it is not an important spawning or rearing location in Chalk Creek. Adult cutthroat trout from this section of Chalk Creek, likely utilize the South Fork of Chalk Creek and its' tributaries to spawn. The only non-native salmonid caught in this part of Chalk Creek section 02 was one rainbow trout in 1968 and this fish was likely one that was planted.

#### High

The stream survey in this station was completed on August 3, 1999. This station began upstream from the first bridge crossing downstream from the East Fork of Chalk Creek confluence. UTM's for this station were: 4531803N and 0487012E. The length of the electrofished station was 190 m.

Two-pass electrofishing resulted in the capture of 34 age-1 and older Bonneville cutthroat trout ( $178 \pm 20/\text{stream km}$  [ $287 \pm 32/\text{stream mile}$ ]; 32 kg/ha [ $28 \text{ lb/acre}$ ]; Table 2; Figure 3), 26

mountain sucker ( $150 \pm 45/\text{stream km}$  [ $242 \pm 73/\text{stream mile}$ ]), 63 mottled sculpin ( $365 \pm 70/\text{stream km}$  [ $587 \pm 113/\text{stream mile}$ ]), 1 speckled dace, and 6 longnose dace ( $31 \pm 11/\text{stream km}$  [ $50 \pm 17/\text{stream mile}$ ]). The speckled dace was caught on the second electrofishing pass, consequently a population estimate was not available. The HQI predicted a higher trout biomass (175 kg/ha) even with cover likely being underestimated. Thirty whole cutthroat trout were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000.

Chalk Creek section 02 (high) had been surveyed two times before by the UDWR. In 1992, two-pass electrofishing in a 161 m station located downstream from the first bridge crossing downstream from the East Fork of Chalk Creek confluence produced 58 Bonneville cutthroat trout ( $393 \pm 56/\text{stream km}$  [ $633 \pm 90/\text{stream mile}$ ]; 45 kg/ha [40 lb/acre]), 2 rainbow trout ( $12 \pm 0/\text{stream km}$  [ $20 \pm 0/\text{stream mile}$ ]; 4 kg/ha [3 lb/acre]), 55 mountain sucker ( $490 \pm 112/\text{stream km}$ ;  $789 \pm 180/\text{stream mile}$ ), 237 mottled sculpin, and 62 dace (longnose and speckled). More mottled sculpin and dace were caught on the second electrofishing pass, consequently, a population estimate was not available. In 1968, one-pass electrofishing in a 161 m station located downstream from the first bridge crossing downstream from the East Fork of Chalk Creek confluence produced 40 Bonneville cutthroat trout ( $249/\text{stream km}$ ;  $400/\text{stream mile}$ ), mountain sucker were common, and dace were sparse.

The Bonneville cutthroat trout population in Chalk Creek section 02 below the East Fork of Chalk Creek confluence appears to be maintaining at a moderate level of adult fish (Table 2). The presence of smaller age classes of cutthroat trout (Table 2) in this portion of Chalk Creek are potentially products from the spawn in the East Fork of Chalk Creek. The only non-native salmonids caught in this part of Chalk Creek section 02 were two planted rainbow trout in 1992. With the discontinuation of rainbow trout stocking at bridge crossings in the Chalk Creek Drainage in 1998, these fish have likely left the system quickly.

Table 2. Population statistics for Bonneville cutthroat trout sampled in section 02 of Chalk Creek, 1968, 1970, 1991, 1992, 1997, and 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1970 low	12 <sup>1</sup> (20) <sup>1</sup>		248 (222-274)	150(91-208)	0.92
1991 low	44 <sup>2</sup> (70) <sup>2</sup>		298	266	0.92
1997 low	89 <sup>3</sup> (144) <sup>3</sup>	162 <sup>3</sup> (147) <sup>3</sup>	259(191-397)	187(76-569)	0.96
1999 low	100 <sup>3</sup> (161) <sup>3</sup>	203 <sup>3</sup> (184) <sup>3</sup>	274(189-394)	210(62-525)	0.92
1968 high	249 <sup>1</sup> (400) <sup>1</sup>				
1992 high	393 <sup>2</sup> (633) <sup>2</sup>	45 <sup>2</sup> (40) <sup>2</sup>	190(55-357)	100(2-550)	1.13
1999 high	178 <sup>2</sup> (287) <sup>2</sup>	32 <sup>2</sup> (28) <sup>2</sup>	234(114-364)	154(16-463)	0.98

<sup>1</sup> Base on one-pass electrofishing.

<sup>2</sup> Base on two-pass electrofishing.

<sup>3</sup> Base on the actual number of fish caught.



Figure 2. Diversion barrier at the downstream end of Chalk Creek section 02 is located 6.5 km upstream from the confluence with the Weber River.

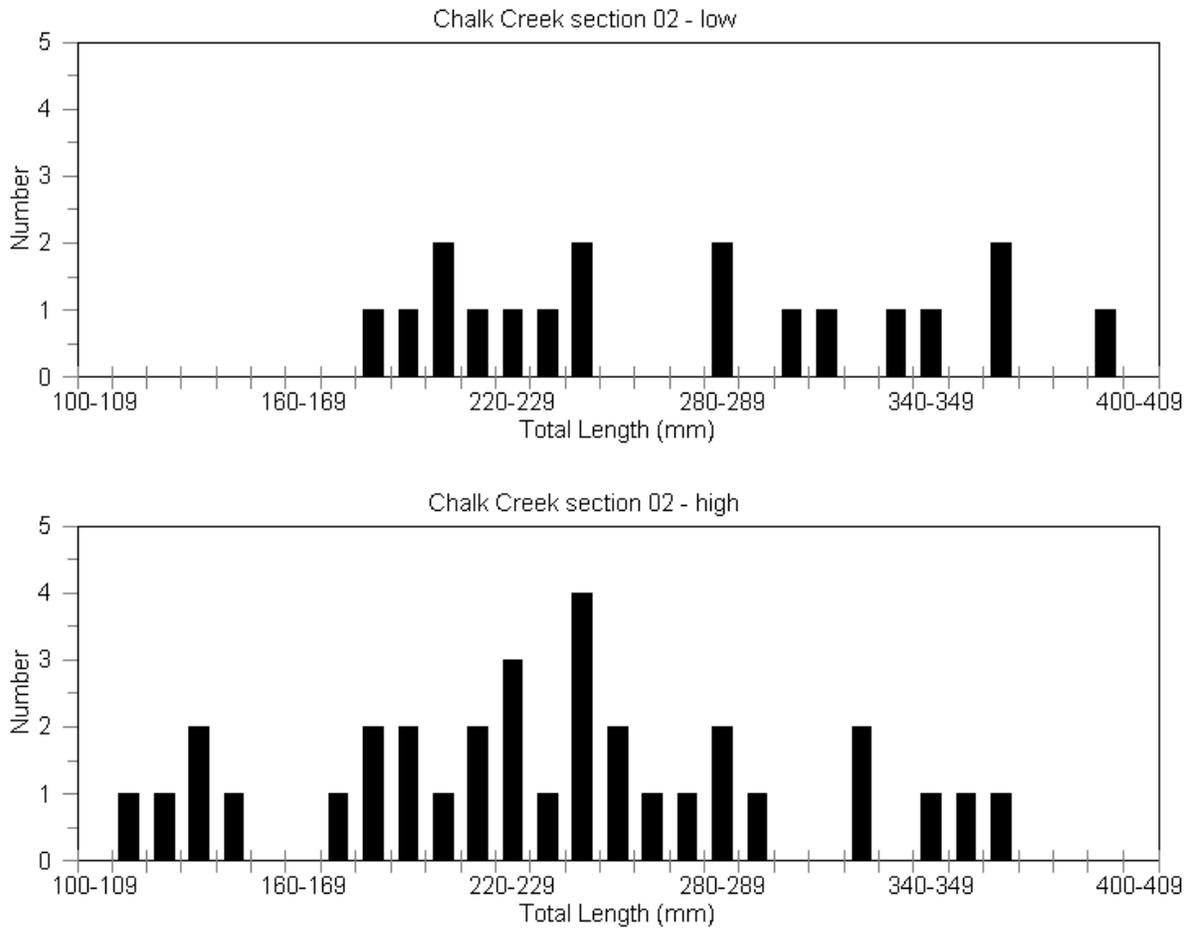


Figure 3. Size distribution of cutthroat trout sampled in Chalk Creek section 02, 1999.

### **South Fork of Chalk Creek**

**IVAP230D 01**

The South Fork of Chalk Creek section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek, a major tributary to the Weber River. The South Fork of Chalk Creek is in Summit County (Turner Hollow, Upton, and Hidden Lake USGS Quads) with the entire drainage being private. Fish species present in the South Fork of Chalk Creek are Bonneville cutthroat trout, mottled sculpin, longnose dace, speckled dace, mountain sucker, Utah sucker, and redbside shiner. Between 500-1,000 rainbow trout catchables were stocked annually at bridge crossings in Chalk Creek until 1998, consequently, rainbow trout may be present in the lower reaches of the South Fork of Chalk Creek Drainage. Despite the stocking history in the drainage, all trout caught in 1998 and 1999 phenotypically looked like Bonneville cutthroat trout. The South Fork of Chalk Creek is classified as a IVB fishery for Bonneville cutthroat trout. No barriers exist for the upstream movement of fish from Chalk Creek.

#### Low

The stream survey on the South Fork of Chalk Creek (low) was completed on July 17, 1998. This 90 m survey began just upstream from the confluence with Fish Creek. UTM's for this station were: 4528006N and 0480936E.

Two-pass electrofishing resulted in the capture of 14 age-1 or older Bonneville cutthroat trout ( $185 \pm 87$ /stream km [ $298 \pm 140$ /stream mile] (Table 3; Figure 4); 11 kg/ha [10 lb/acre]), 27 mottled sculpin ( $459 \pm 392$ /stream km;  $738 \pm 630$ /stream mile), 2 mountain sucker, 2 speckled dace, and 1 longnose dace. Equal numbers or a higher catch rate on the second electrofishing pass did not allow calculation of population estimates for mountain sucker, speckled dace, and longnose dace. At least 3 year classes of cutthroat trout appeared to be represented in the sample (Figure 4). The HQI predicted the same trout biomass (11 kg/ha) with cover and macro invertebrates being the limiting factors. An additional 100 m of stream was electrofished to obtain 33 Bonneville cutthroat trout for genetic analysis. The 33 cutthroat trout whole fish samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples were submitted to the Salt Lake Office on September 30, 1998.

The South Fork of Chalk Creek (low) has been sampled three times before by the UDWR. Comparison of population statistics between surveys is difficult, however, because only one-pass electrofishing was completed in 1954 and 1970. In 1954, one-pass electrofishing in a 161 m reach located 1.2 km upstream from the confluence with Chalk Creek produced 7 Bonneville cutthroat trout

(44/stream km; 70/stream mile) (Table 3), 2 rainbow trout (12/stream km; 20/stream mile, 8 mountain sucker (50/stream km; 80/stream mile), 3 dace (19/stream km; 30/stream mile), and 14 mottled sculpin (87/stream km; 140/stream mile). The two rainbow trout were likely planted fish. In 1970, 21 Bonneville cutthroat trout (131/stream km; 210/stream mile), one redbside shiner (6/stream km; 10/stream mile), abundant mottled sculpin, and Utah sucker were caught in a 161 m station. This station was located directly upstream from the confluence with Chalk Creek which may have influenced the number of trout caught. In 1991, two-pass electrofishing produced 2 Bonneville cutthroat ( $12 \pm 0$ /stream km;  $20 \pm 0$ /stream mile), 77 mottled sculpin ( $622 \pm 193$ /stream km;  $1001 \pm 310$ /stream mile), 76 mountain sucker ( $622 \pm 199$ /stream km;  $1000 \pm 320$ /stream mile), 20 redbside shiner ( $126 \pm 6$ /stream km;  $202 \pm 10$ /stream mile), and 680 dace (speckled and longnose) ( $11683 \pm 6277$ /stream km;  $18798 \pm 10099$ /stream mile). This electrofishing station was approximately 3.2 km upstream from the confluence with the Chalk Creek mainstem.

The Bonneville cutthroat trout population in the South Fork of Chalk Creek (low) appears to be maintaining at a moderate level of adult fish (Table 3). The presence of smaller cutthroat trout in the lower portion of the South Fork of Chalk Creek indicates that this stream and its' tributaries are utilized for spawning. The only non-native salmonids caught in the South Fork of Chalk Creek were two planted rainbow trout in 1954.

#### High

The stream survey on the South Fork of Chalk Creek (high) was completed on July 7, 1999. This 105 m survey began below the two headwater forks with the upper end of the station at the 4WD road crossing. UTM's for this station were: 4521479N and 0484962E.

Two-pass electrofishing resulted in the capture of 43 age-1 or older Bonneville cutthroat trout ( $426 \pm 38$ /stream km [ $685 \pm 61$ /stream mile] (Table 3; Figure 4); 62 kg/ha [55 lb/acre]) and 2 mottled sculpin. More mottled sculpin were present, but not netted. At least 4 year classes of cutthroat trout appeared to be represented in the sample (Figure 4) with the majority of fish being age-1 or age-2. The headwaters of the South Fork of Chalk Creek appear to be utilized by cutthroat trout for spawning. The HQI predicted a slightly higher trout biomass (78 kg/ha) even with cover likely being underestimated. Thirty whole cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter of 1999/2000. This section of the South Fork of Chalk Creek had not been previously sampled before by the UDWR.

Table 3. Population statistics for Bonneville cutthroat trout sampled in the South Fork of Chalk Creek, 1954, 1970, 1991, 1998, and 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1954 low	44 <sup>1</sup> (70) <sup>1</sup>				
1970 low	131 <sup>1</sup> (210) <sup>1</sup>	4 <sup>1</sup> (4) <sup>1</sup>	180(120-275)	65(14-195)	0.99
1991 low	12 <sup>2</sup> (20) <sup>2</sup>	2 <sup>2</sup> (2) <sup>2</sup>	186(180-191)	68(65-70)	1.06
1998 low	185 <sup>2</sup> (298) <sup>2</sup>	11 <sup>2</sup> (10) <sup>2</sup>	152(87-210)	42(6-81)	1.07
1999 high	426 <sup>2</sup> (685) <sup>2</sup>	62 <sup>2</sup> (55) <sup>2</sup>	154(76-290)	58(5-209)	1.15

<sup>1</sup> Based on one-pass electrofishing.

<sup>2</sup> Based on two-pass electrofishing.

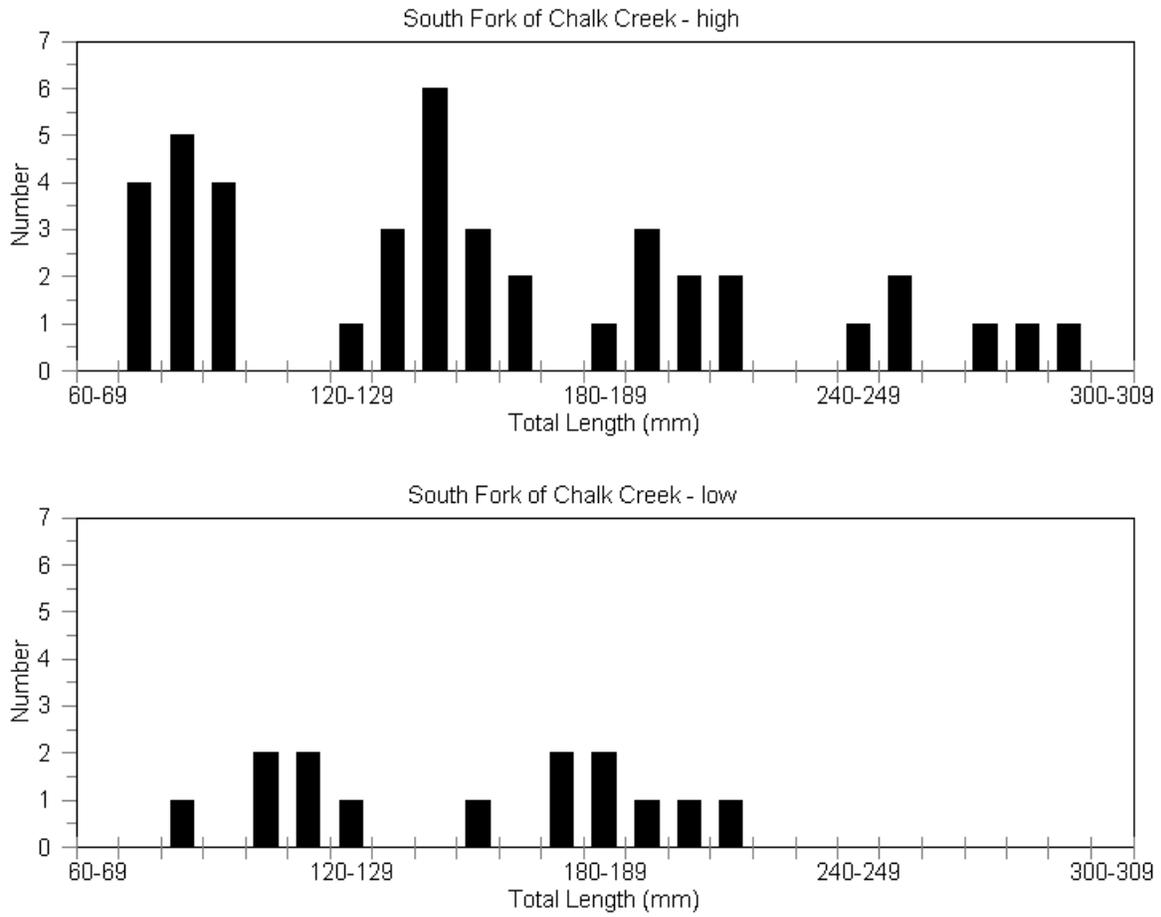


Figure 4. Size distribution of cutthroat trout sampled in the South Fork of Chalk Creek, 1998 and 1999.

## **Elkhorn Canyon**

**IVAP230D01 01**

Elkhorn Canyon section 01 (confluence with the South Fork of Chalk Creek upstream to the headwaters) is a tributary to the South Fork of Chalk Creek. Elkhorn Canyon is in Summit County (Turner Hollow and Crandall Canyon USGS Quads) with the entire drainage being private. Fish species present in Elkhorn Canyon are Bonneville cutthroat trout. Mottled sculpin, longnose dace, speckled dace, mountain sucker, and redbreast shiner may be present in the lower reaches of the stream. All trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. Elkhorn Canyon is classified as a IVB fishery for Bonneville cutthroat trout. A diversion barrier (0.9 m in height) exists 2 km up the road that follows Elkhorn Canyon from the South Fork of Chalk Creek. Cutthroat trout were found upstream from this diversion, however, it was not determined if the diversion functions as a barrier. In addition, water is diverted from the headwaters of Elkhorn Canyon for municipal use in Hoytsville, Utah, consequently a barrier may exist in the headwater reaches of this stream. Stream flows also may become critical to fish during low flow conditions, depending on the amount of water diverted.

The stream survey on Elkhorn Canyon was completed on July 6, 1999. This 100 m survey began 4.8 km up the road that follows Elkhorn Canyon from the South Fork of Chalk Creek. UTM coordinates for this station were: 4526043N and 0475241E.

Two-pass electrofishing resulted in the capture of 6 age-1 or older Bonneville cutthroat trout ( $60 \pm 0$ /stream km [ $97 \pm 0$ /stream mile] (Table 4; Figure 5); 47 kg/ha [42 lb/acre]). All cutthroat trout were adult fish (Figure 5), indicating limited at best reproduction in this stream. The HQI predicted a lower trout biomass (12 kg/ha) with late summer stream flow, cover, eroding banks, number of macroinvertebrates, water velocity, and stream width being limited. An additional 500 m of stream was electrofished to obtain 30 Bonneville cutthroat trout (10 whole, 20 fin clips) for genetic analysis. The 30 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. Elkhorn Canyon had not been sampled before by the UDWR.

Table 4. Population statistics for Bonneville cutthroat trout sampled in Elkhorn Canyon, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	60 (97)	47 (42)	233(195-278)	143(82-206)	1.10

### Elkhorn Canyon

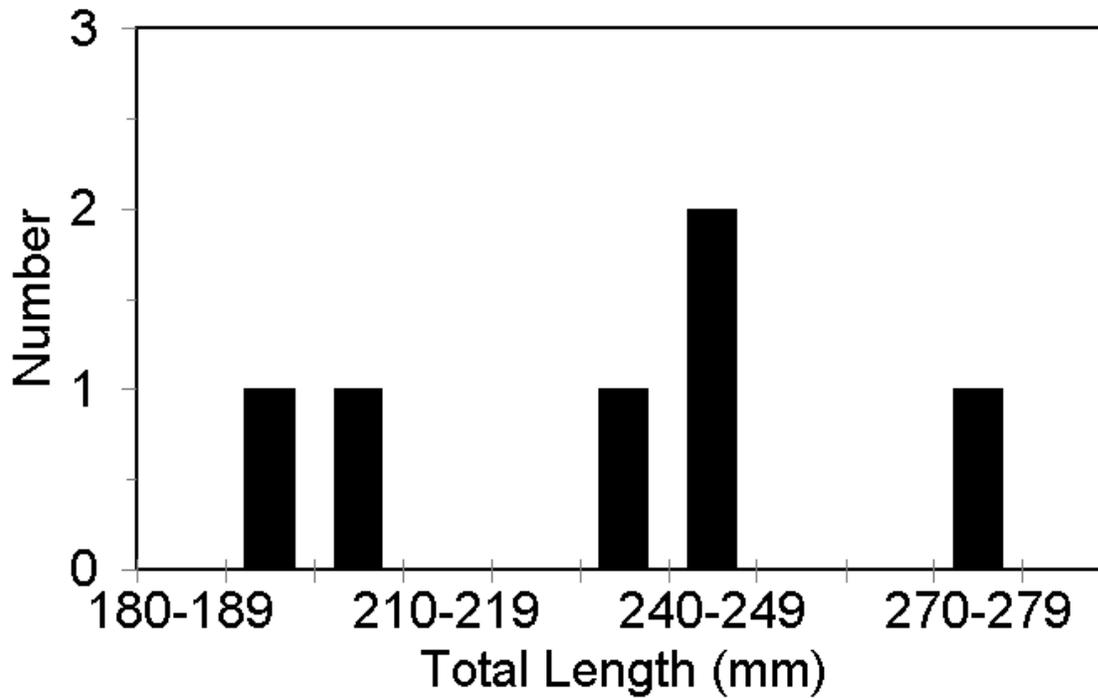


Figure 5. Size distribution of cutthroat trout sampled in Elkhorn Canyon, 1999.

## Lodgepole Creek

IVAP230D02 01

Lodgepole Creek section 01 (confluence with the South Fork of Chalk Creek upstream to the headwaters) is a tributary to the South Fork of Chalk Creek. Lodgepole Creek is in Summit County (Turner Hollow USGS Quad) with the entire drainage being private. Fish species present in Lodgepole Creek are Bonneville cutthroat trout. Mottled sculpin, longnose dace, speckled dace, mountain sucker, and redbside shiner may be present in the lower reaches of the stream. All trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. Lodgepole Creek is classified as a IVB fishery for Bonneville cutthroat trout. A 1.1 m waterfall exists 650 m upstream from the South Fork of Chalk Creek. Even though a plunge pool exists below the waterfall, spot electrofishing upstream from the waterfall revealed no fish. In addition, several old on-channel stock ponds exist which would likely prevent the upstream movement of fish. A private landowner in the Lodgepole Creek Drainage requested native cutthroat for his private pond which was completed in 1998. The pond is approximately 4 km upstream from the South Fork of Chalk Creek. This landowner is willing to allow the UDWR access to his pond if the UDWR wants to use the pond to hold a brood source of cutthroat trout for the Weber River. Approximately 130 Bonneville cutthroat trout were transplanted in September 1998 into this pond (approximately 65/surface acre) from Fish Creek, which is in the South Fork of Chalk Creek Drainage.

The stream survey on Lodgepole Creek was completed on July 6, 1999. This 100 m survey began approximately 505 m up the road that follows Lodgepole Creek from the South Fork of Chalk Creek. The upper boundary of the station was the 1.1 m waterfall. UTM's for this station were: 4529767N and 0477222E.

Two-pass electrofishing resulted in the capture of 13 age-1 or older Bonneville cutthroat trout ( $131 \pm 10$ /stream km [ $211 \pm 16$ /stream mile] (Table 5; Figure 6); 127 kg/ha [133 lb/acre]). All cutthroat trout were  $\geq$ age-2 fish (Figure 6), indicating limited at best reproduction in this stream. The HQI predicted a lower trout biomass (50 kg/ha) with eroding banks, number of macroinvertebrates, and water velocity being limited. An additional 200 m of stream was electrofished to obtain 19 total Bonneville cutthroat trout (10 whole, 9 fin clips) for genetic analysis. The 19 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter of 1999/2000. Lodgepole Creek had not been sampled before by the UDWR.

Table 5. Population statistics for Bonneville cutthroat trout sampled in Lodgepole Creek, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	131 (211)	127 (113)	197(115-262)	108(19-246)	1.25

### Lodgepole Creek

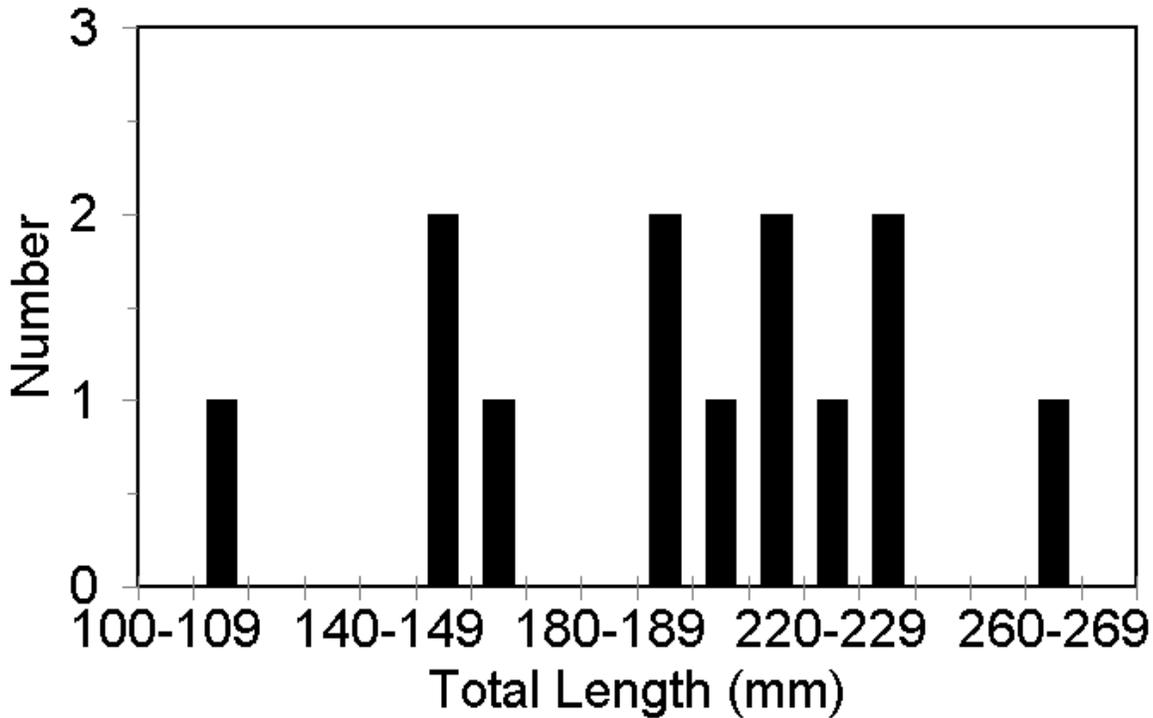


Figure 6. Size distribution of cutthroat trout sampled in Lodgepole Creek, 1999.

**Cottonwood Canyon****IVAP230D02A 01**

Cottonwood Canyon section 01 (confluence with Lodgepole Creek upstream to the headwaters) is a tributary to Lodgepole Creek. Cottonwood Canyon is in Summit County (Turner Hollow USGS Quad) with the entire drainage being private. Although Cottonwood Canyon has not been previously sampled by the UDWR, no fish species are known to be present. No water was observed coming from Cottonwood Canyon during surveys in 1999 on Lodgepole Creek.

**Branch Creek****IVAP230D04 01**

Branch Creek section 01 (confluence with the South Fork of Chalk Creek upstream to the headwaters) is a tributary to the South Fork of Chalk Creek. Branch Creek is in Summit County (Upton and Hidden Lake USGS Quads) with the entire drainage being private. Approximately 300 m of Branch Creek, 1 km upstream from the confluence with the South Fork of Chalk Creek, was walked on July 2, 1999 and no fish were observed. In addition, water flows did not look conducive to a resident fish population. Conversation with the landowner also revealed that Branch Creek frequently goes dry in late summer. On good water years, this stream may contain a small population of cutthroat trout.

**Fish Creek****IVAP230D05 01**

Fish Creek is a tributary to the South Fork of Chalk Creek, a major tributary to Chalk Creek. Fish Creek is in Summit County (Upton and Hidden Lake USGS Quads) with the entire drainage being private. Fish species present in Fish Creek are Bonneville cutthroat trout and mottled sculpin. Because no stocking records exist for Fish Creek and the stream drops approximately 2 meters through a culvert near the confluence with the South Fork of Chalk Creek, these cutthroat trout have less potential of past hybridization. In addition, all cutthroat trout caught in 1998 phenotypically looked like Bonneville cutthroat trout.

The stream survey on Fish Creek was completed on September 23, 1998. Section 01 was surveyed with one 100 m station approximately 9 km upstream from the confluence with the South Fork of Chalk Creek. UTM's for this station were: 4527420N and 0489300E. Fish Creek is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 92 age-1 or older Bonneville cutthroat trout ( $1009 \pm 110$ /stream km [ $1623 \pm 177$ /stream mile]) (Table 6; Figure 7); 144 kg/ha [129 lb/acre], 67 age-0 Bonneville cutthroat trout ( $974 \pm 462$ /stream km [ $1567 \pm 743$ /stream mile]) (Table 6; Figure 7); 127 kg/ha [133 lb/acre], and 17 mottled sculpin ( $1304 \pm 9369$ /stream mile). At least 4 year classes of cutthroat trout appeared to be represented in the sample (Figure 7). The HQI predicted a lower trout biomass (62

kg/ha). The 30 cutthroat trout whole fish samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples were submitted to the Salt Lake Office on September 30, 1998. Fish Creek had not been sampled before by the UDWR.

Table 6. Population statistics for Bonneville cutthroat trout sampled in Fish Creek, 1998.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1998 (≥age-1)	1009 (1623)	144 (129)	156(110-264)	42(11-235)	0.87
1998 (age-0)	974 (1567)	2 (2)	56(47-62)	1(0.5-2)	

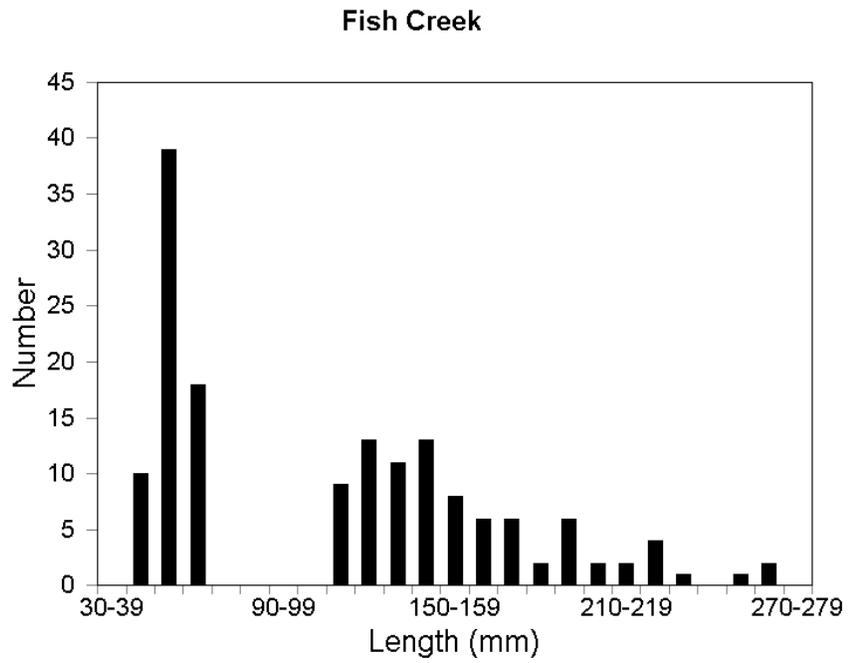


Figure 7. Size distribution of cutthroat trout sampled in Fish Creek, 1998.

**unnamed tributary****IVAP230D06 01**

This unnamed tributary section 01 (confluence with the South Fork of Chalk Creek upstream to the headwaters) is a tributary to the South Fork of Chalk Creek. IVAP230D06 is in Summit County (Upton USGS Quad) with the entire drainage being private. Fish species present in IVAP230D06 are Bonneville cutthroat trout. All trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. A culvert (0.6 m in height with a 0.35 m pool depth) may be a partial barrier to fish movement. The culvert exists near the confluence with the South Fork of Chalk Creek. This culvert is not likely a complete barrier to fish movement because IVAP230D06 likely will dry up during drought years.

The stream survey on IVAP230D06 was completed on July 13, 1999. Section 01 was surveyed with one 100 m station approximately 5 km upstream from the confluence with the South Fork of Chalk Creek where a 4WD road parallels the stream. UTMs for this station were: 4527465N and 0485090E. IVAP230D06 is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 6 age-1 or older Bonneville cutthroat trout (80 ± 100/stream km [129 ± 161/stream mile] (Table 7; Figure 8); 26 kg/ha [29 lb/acre]). All cutthroat trout were adult fish (Figure 8), indicating limited at best reproduction in this stream. The HQI predicted a similar trout biomass (22 kg/ha). An additional 600 m of stream was electrofished to obtain 30 Bonneville cutthroat trout (10 whole, 20 fin clips) for genetic analysis. The 30 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. IVAP230D06 had not been sampled before by the UDWR.

Table 7. Population statistics for Bonneville cutthroat trout sampled in IVAP230D06, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	80 (129)	29 (26)	147(102-215)	43(14-124)	1.12

IVAP230D06

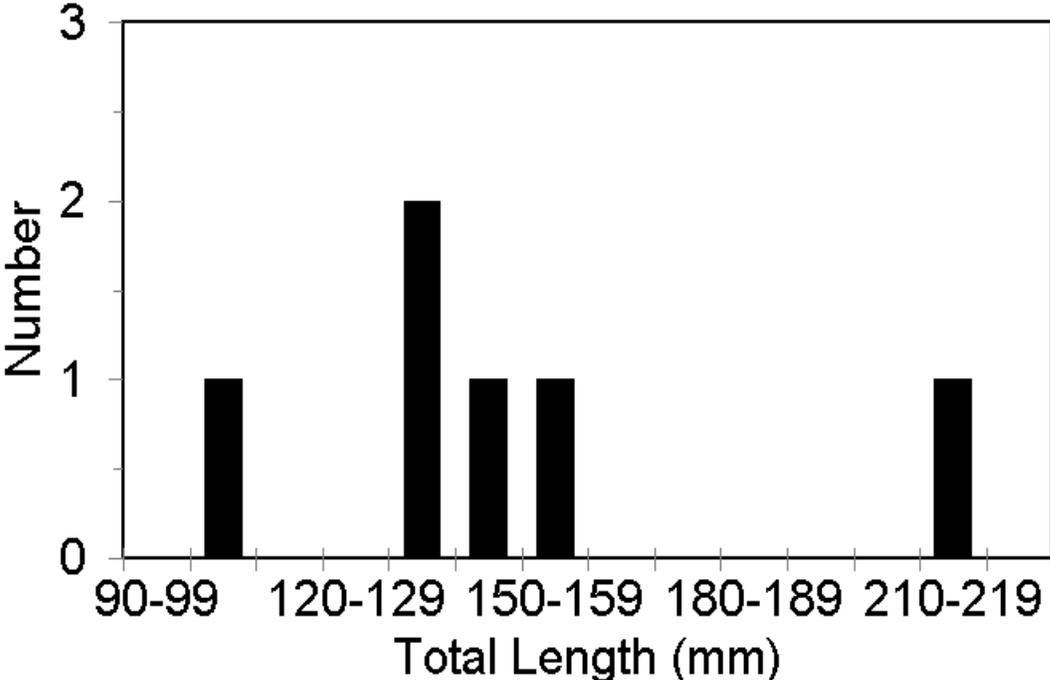


Figure 8. Size distribution of cutthroat trout sampled in IVAP230D06, 1999.

**unnamed tributary**

**IVAP230D09 01**

This unnamed tributary section 01 (confluence with the South Fork of Chalk Creek upstream to the headwaters) is a tributary to the South Fork of Chalk Creek. IVAP230D09 is in Summit County (Hidden Lake USGS Quad) with the entire drainage being private. Fish species present in IVAP230D09 are Bonneville cutthroat trout and mountain sucker. All trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. A series of beaver dams (Figure 9) may prevent the upstream movement of fish at least during low flows.



Figure 9. A 3.4 m high beaver dam on IVAP230D09.

The stream survey on IVAP230D09 was completed on July 13, 1999. Section 01 was surveyed with one 100 m station located directly below the confluence with the two main forks. UTM's for this station were: 4521207N and 0483165E. IVAP230D09 is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 10 age-1 or older Bonneville cutthroat trout (107 ± 29/stream km [172 ± 47/stream mile] (Table 8; Figure 10); 32 kg/ha [28 lb/acre]). All but one cutthroat trout were adult fish (Figure 10), indicating limited reproduction in this stream. The HQI predicted a similar trout biomass (34 kg/ha). An additional 150 m of stream was electrofished to obtain 30 Bonneville cutthroat trout (10 whole, 20 fin clips) for genetic analysis. The 30 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. One adult mountain sucker was caught while spot electrofishing. IVAP230D09 had not been sampled before by the UDWR.

Table 8. Population statistics for Bonneville cutthroat trout sampled in IVAP230D09, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	107 (172)	32 (28)	176(87-332)	105(9-373)	1.17

# IVAP230D09

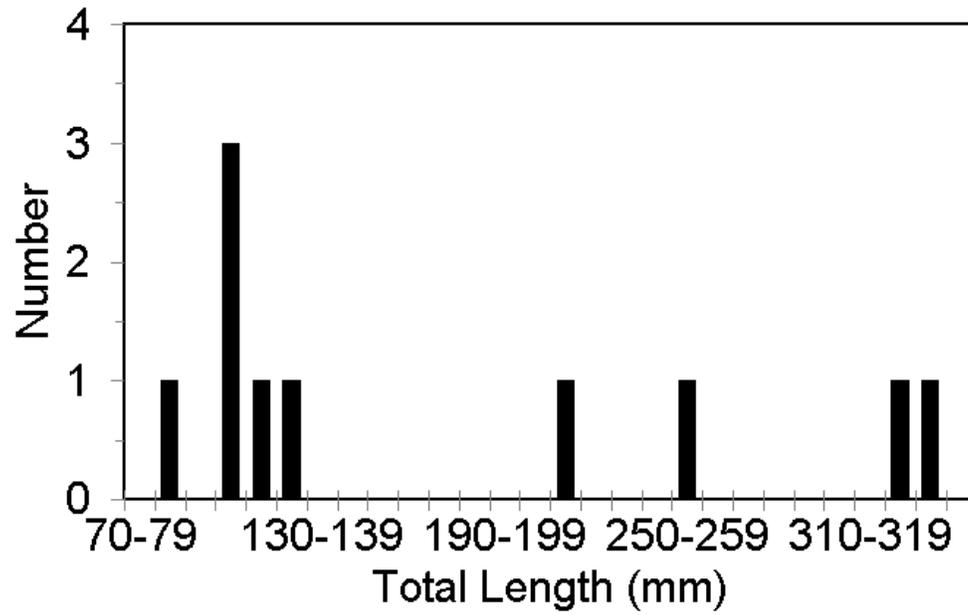


Figure 10. Size

Size distribution of cutthroat trout sampled in IVAP230D09, 1999.

**Middle Canyon****IVAP230F 01**

Middle Canyon section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek section 02. Middle Canyon is in Summit County (Turner Hollow USGS Quad) with the entire drainage being private. Approximately 200 m of Middle Canyon from the Chalk Creek Road upstream was walked on July 2, 1999. Water flows were not conducive to a resident fish population.

**Clark Canyon****IVAP230G 01**

Clark Canyon section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek section 02. Clark Canyon is in Summit County (Turner Hollow and Heiners Creek USGS Quads) with the entire drainage being private. Approximately 600 m of Clark Canyon from the Chalk Creek Road upstream was walked on July 2, 1999. Water flows were not conducive to a resident fish population.

**Huff Creek****IVAP230H 01**

Huff Creek section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek, a major tributary to the Weber River. Huff Creek is in Summit County (Upton and Castle Rock USGS Quads) with the entire drainage being private. Fish species present in Huff Creek are Bonneville cutthroat trout, mottled sculpin, and mountain sucker. Between 500-1,000 rainbow trout catchables were stocked annually at bridge crossings in Chalk Creek until 1998, consequently, rainbow trout may be present in the lower reaches of Huff Creek. Despite the stocking history in the drainage, all trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. Huff Creek is classified as a IVB fishery for Bonneville cutthroat trout. No barriers exist for the upstream movement of fish from Chalk Creek.

Low

The stream survey on Huff Creek (low) was completed on July 26, 1999. This 100 m survey began 400 m downstream from the Castle Rock gate. UTM's for this station were: 4538198N and 0481207E.

Two-pass electrofishing resulted in the capture of 16 age-1 or older Bonneville cutthroat trout ( $163 \pm 21$ /stream km [ $263 \pm 33$ /stream mile] (Table 9; Figure 11); 61 kg/ha [55 lb/acre]), 12 mottled sculpin, 7 adult mountain sucker ( $63 \pm 21$ /stream km;  $101 \pm 34$ /stream mile), and 6 age-0 mountain sucker. Mottled sculpin and age-0 mountain sucker were difficult to net, therefore a population estimate for these species/age classes is not available. At least 3 year classes of cutthroat trout appeared to be represented in the sample (Figure 11). The HQI predicted a lower trout biomass (29 kg/ha). An additional 100 m of stream

was electrofished to obtain 30 whole Bonneville cutthroat trout for genetic analysis. The cutthroat trout were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office during the winter of 1999/2000.

Huff Creek (low) had been sampled once before by the UDWR. In 1978, one-pass electrofishing in a 161 m reach located approximately 300 m downstream from the 1999 station produced 2 Bonneville cutthroat trout (12/stream km; 20/stream mile) with mottled sculpin and mountain sucker being common. The Bonneville cutthroat trout population in Huff Creek (low) appears to be higher in 1999.

#### High

The stream survey on Huff Creek (high) was completed on July 8, 1999. This 100 m survey began approximately 1.6 km downstream from the three headwater forks. UTM's for this station were: 4540818N and 0487007E.

Two-pass electrofishing resulted in the capture of 39 age-1 or older Bonneville cutthroat trout ( $418 \pm 40$ /stream km [ $673 \pm 65$ /stream mile] (Table 9; Figure 11); 111 kg/ha [99 lb/acre]) and 11 mottled sculpin ( $163 \pm 204$ /stream km;  $263 \pm 329$ /stream mile). Many year classes of cutthroat trout are likely present, however they were not readily distinguishable (Figure 11). The HQI predicted a similar trout biomass (89 kg/ha). Thirty whole cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter of 1999/2000. This section of Huff Creek had not been previously sampled before by the UDWR.

Table 9. Population statistics for Bonneville cutthroat trout sampled in Huff Creek, 1978 and 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1978 low	12 <sup>1</sup> (20) <sup>1</sup>				
1999 low	163 <sup>2</sup> (263) <sup>2</sup>	61 <sup>2</sup> (55) <sup>2</sup>	190(122-308)	94(17-253)	1.11
1999 high	418 <sup>2</sup> (673) <sup>2</sup>	111 <sup>2</sup> (99) <sup>2</sup>	170(89-259)	69(10-210)	1.16

<sup>1</sup> Based on one-pass electrofishing.

<sup>2</sup> Based on two-pass electrofishing.

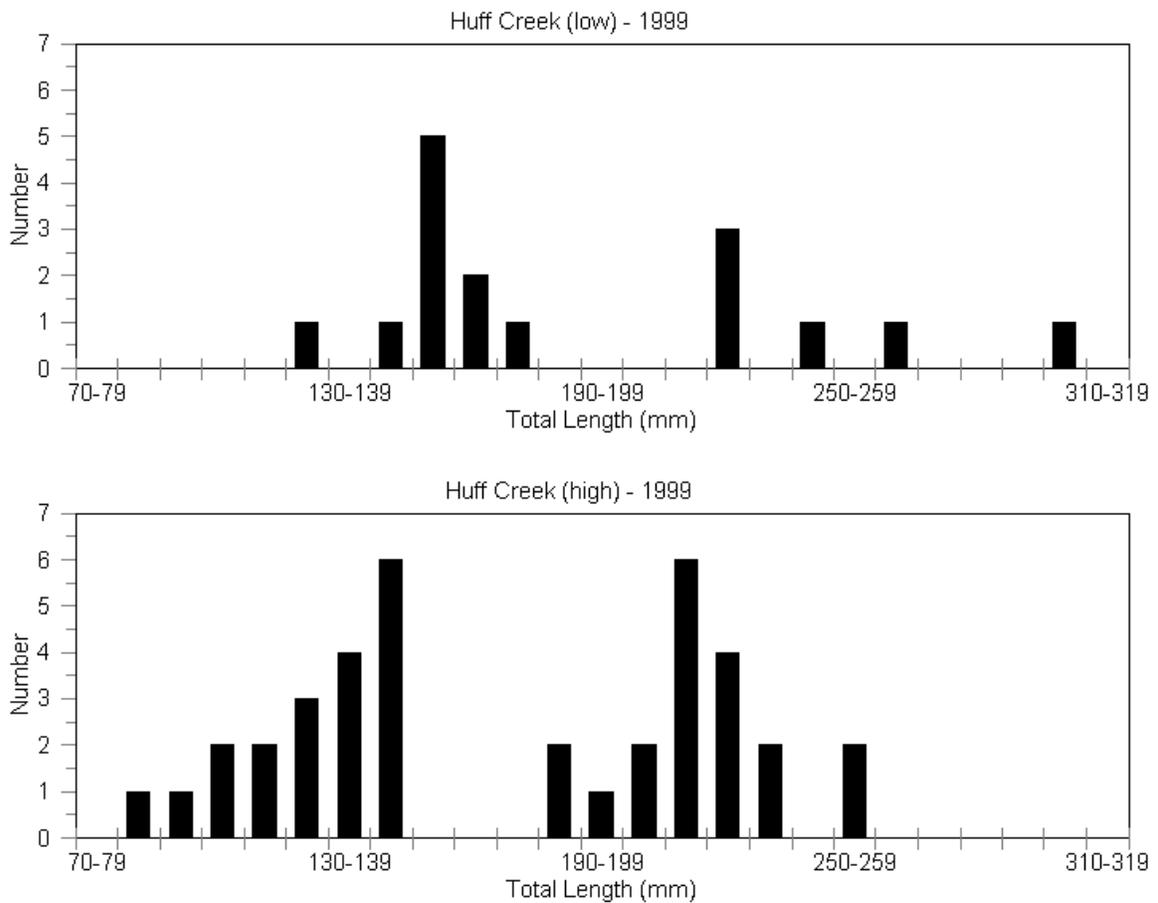


Figure 11. Size distribution of cutthroat trout sampled in Huff Creek, 1999.

**Josh Hollow****No water ID**

Josh Hollow section 01 (confluence with Huff Creek upstream to the headwaters) is a tributary to Huff Creek. Josh Hollow is in Summit County (Upton USGS Quad) with the entire drainage being private. The lower reaches of Josh Hollow were walked on July 2, 1999. Water flows were not conducive to a resident fish population. Upon consulting the Upton USGS Quad following the 1999 surveys, the headwater reaches of Josh Hollow appear to contain more permanent water. It is unlikely, however, that this stream plays much of a role in the Chalk Creek Bonneville cutthroat trout metapopulation.

**Morby Creek****IVAP230I 01**

Morby Creek section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek section 02. Morby Creek is in Summit County (Upton USGS Quad) with the entire drainage being private. The lower reaches of Morby Creek were walked on July 2, 1999. Water flows were not conducive to a resident fish population.

**unnamed tributary****IVAP230K 01**

IVAP230K section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek section 02. IVAP230K is in Summit County (Upton and Red Hole USGS Quads) with the entire drainage being private. IVAP230K was electrofished on July 28, 1999. A one-pass electrofishing survey at 4531784N and 0489604E resulted in 5 adult mountain sucker. Additional spot shocking at 4530713N and 0490315E also produced mountain sucker. The density of mountain sucker at this upper locality was higher than the lower station. Stream flows in IVAP230K were conducive to a resident Bonneville cutthroat trout population, however none were observed while spot shocking. Stream flows near the confluence with Chalk Creek section 02 appear to be intermittent which may discourage cutthroat trout from utilizing this stream.

**East Fork of Chalk Creek****IVAP230M 01**

The East Fork of Chalk Creek section 01 (confluence with Chalk Creek section 02 upstream to the headwaters) is a tributary to Chalk Creek, a major tributary to the Weber River. The East Fork of Chalk Creek is in Summit County (Red Hole USGS Quad) with the entire drainage being private. Fish species present in the East Fork of Chalk Creek are Bonneville cutthroat trout, mottled sculpin, longnose dace, speckled dace, and mountain sucker. Between 500-1,000 rainbow trout catchables were stocked annually at bridge crossings in Chalk Creek until 1998, consequently, rainbow trout may be present in the lower reaches of the East Fork of Chalk Creek Drainage. In addition, a landowner in the East Fork of Chalk Creek admitted to stocking rainbow trout

intended for one of his private ponds into the stream within the last few years. Despite the stocking history in the drainage, all trout caught in 1998 and 1999 phenotypically looked like Bonneville cutthroat trout. The East Fork of Chalk Creek is classified as a IVB fishery for Bonneville cutthroat trout. No barriers exist for the upstream movement of fish from Chalk Creek.

#### Low

The stream survey on the East Fork of Chalk Creek (low) was completed on July 30, 1998. This 100 m station began just upstream from the confluence with the Middle Fork. UTM's for this station were: 4530153N and 0492505E.

Two-pass electrofishing resulted in the capture of 18 age-1 or older Bonneville cutthroat trout ( $183 \pm 10/\text{stream km}$  [ $294 \pm 16/\text{stream mile}$ ] (Table 10; Figure 12);  $50 \text{ kg/ha}$  [ $45 \text{ lb/acre}$ ]), 40 mottled sculpin ( $395 \pm 10/\text{stream km}$ ;  $635 \pm 16/\text{stream mile}$ ), and 10 mountain sucker ( $114 \pm 19/\text{stream km}$ ;  $183 \pm 31/\text{stream mile}$ ). At least 3 year classes of cutthroat trout appeared to be represented in the sample with the majority of the fish being age-1 (Figure 12). The HQI predicted a higher trout biomass ( $88 \text{ kg/ha}$ ), however, cover was likely underestimated. An additional 150 m of stream was electrofished to obtain 30 Bonneville cutthroat trout for genetic analysis. The 30 cutthroat trout whole fish samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples were submitted to the Salt Lake Office on September 30, 1998.

The East Fork of Chalk Creek (low) has been sampled three times before by the UDWR. Comparison of population statistics between surveys is difficult, however, because only one-pass electrofishing was completed in 1979 and 1981. In 1979, one-pass electrofishing produced 10 Bonneville cutthroat trout ( $503/\text{stream km}$ ;  $810/\text{stream mile}$ ; Table 10) and 16 cutthroat trout were caught in 1981 ( $199/\text{stream km}$ ;  $320/\text{stream mile}$ ; Table 10). Both of these surveys were within the lower 3 km of the East Fork of Chalk Creek. In 1992, two-pass electrofishing produced 711 Bonneville cutthroat trout/ $\text{stream km}$  ( $1144/\text{stream mile}$ ) (Table 10). The 1992 electrofishing station was directly below the confluence with the Middle Fork. Although this station was the closest to the 1998 survey, the Middle Fork contributes significant water and the stream is three times the width compared to where the 1998 survey was completed. The larger stream would be expected to support more trout.

The Bonneville cutthroat trout population in the East Fork of Chalk Creek (low) appears to be maintaining at a moderate/high

level of adult fish (Table 10). The presence of smaller cutthroat trout in the lower portions of the East Fork of Chalk Creek (Figure 12) indicates that this stream and its' tributaries are utilized for spawning. No non-native salmonids have been sampled in the East Fork of Chalk Creek.

#### High

The stream survey on the East Fork of Chalk Creek (high) was completed on July 22, 1999. This 104 m survey began at the last road crossing before Blue Lake. UTMs for this station were: 4528043N and 0498070E.

Two-pass electrofishing resulted in the capture of 29 age-1 or older Bonneville cutthroat trout ( $310 \pm 68$ /stream km [ $499 \pm 109$ /stream mile] (Table 10; Figure 12); 28 kg/ha [25 lb/acre]. At least 3 year classes of cutthroat trout appeared to be represented in the sample (Figure 12) with the majority of fish being age-1 or age-2. The headwaters of the East Fork of Chalk Creek appear to be utilized by cutthroat trout for spawning. The HQI predicted a considerably higher trout biomass (162 kg/ha), however, the East Fork of Chalk Creek (high) is a high elevation, relatively unproductive stream that can not be expected to produce large sized fish. Thirty whole cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. This section of the East Fork of Chalk Creek had not been previously sampled before by the UDWR.

Table 10. Population statistics for Bonneville cutthroat trout sampled in the East Fork of Chalk Creek, 1979, 1981, 1992, 1998, and 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1979 low	503 <sup>1</sup> (810) <sup>1</sup>				
1981 low	199 <sup>1</sup> (320) <sup>1</sup>	57 <sup>1</sup> (51) <sup>1</sup>	116(91-242)	22(1-160)	0.92
1992 low	711 <sup>2</sup> (1144) <sup>2</sup>	118 <sup>2</sup> (105) <sup>2</sup>	149(48-298)	45(1-260)	0.92
1998 low	183 <sup>2</sup> (294) <sup>2</sup>	50 <sup>2</sup> (45) <sup>2</sup>	126(84-262)	27(4-157)	0.80
1999 high	310 <sup>2</sup> (499) <sup>2</sup>	28 <sup>2</sup> (25) <sup>2</sup>	135(51-221)	36(0.5-123)	1.06

<sup>1</sup> Based on one-pass electrofishing.

<sup>2</sup> Based on two-pass electrofishing.

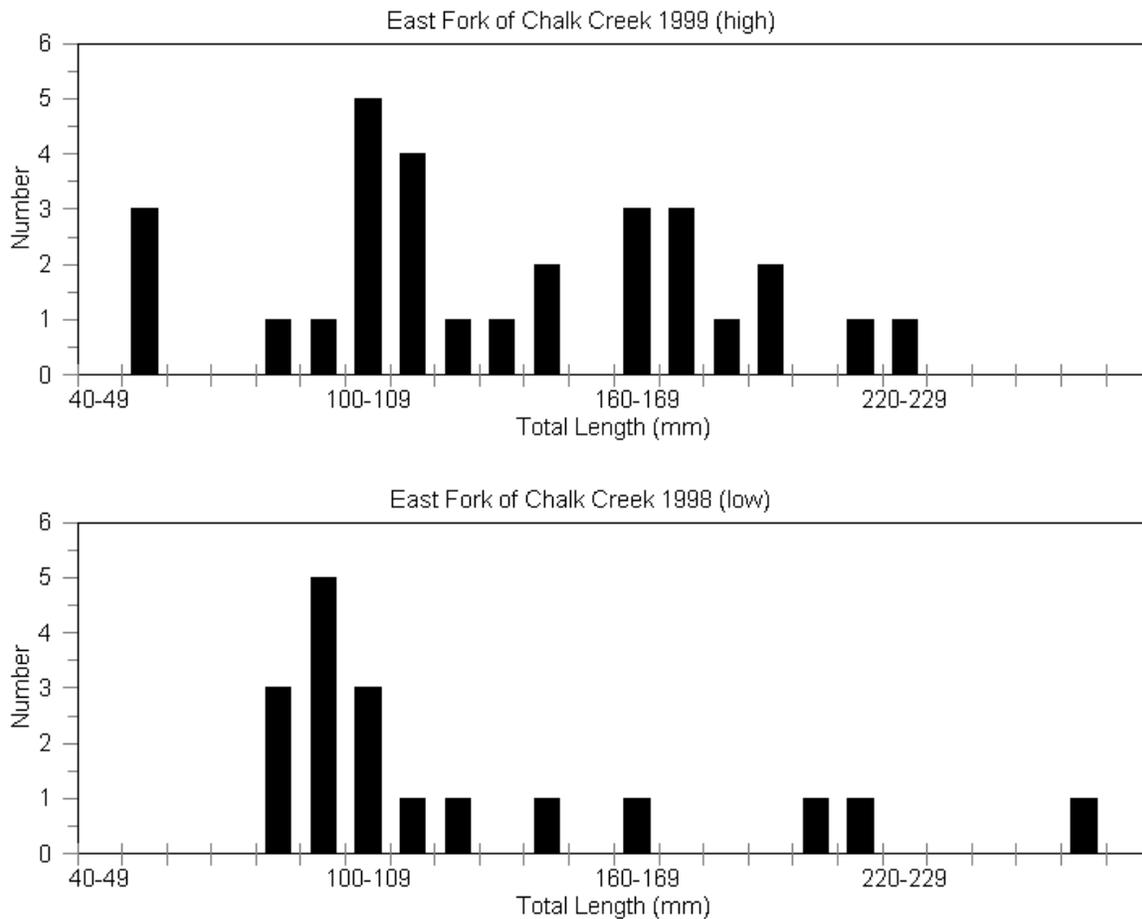


Figure 12. Size distribution of cutthroat trout sampled in the East Fork of Chalk Creek, 1998 and 1999.

## **Middle Fork**

**IVAP230M01 01**

Middle Fork section 01 (confluence with the East Fork of Chalk Creek upstream to the headwaters) is a tributary to the East Fork of Chalk Creek, a major tributary to Chalk Creek. Middle Fork is in Summit County (Red Hole and Slader Basin USGS Quads) with the entire drainage being private. Fish species present in Middle Fork are Bonneville cutthroat trout, mottled sculpin, and brook trout are present in the headwater reaches. All cutthroat trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. Middle Fork is classified as a IVB fishery for Bonneville cutthroat trout. No barriers exist for the upstream movement of fish from Chalk Creek.

### Low

The stream survey on Middle Fork (low) was completed on July 20, 1999. This 100 m station began at the 4WD road crossing. UTMs for this station were: 4526979N and 0495016E.

Two-pass electrofishing resulted in the capture of 15 age-1 or older Bonneville cutthroat trout ( $154 \pm 21$ /stream km [ $247 \pm 33$ /stream mile] (Table 11; Figure 13); 19 kg/ha [16 lb/acre]) and one mottled sculpin. More mottled sculpin were observed but not effectively netted, therefore a population estimate for them was not possible. At least 3 year classes of cutthroat trout appeared to be represented (Figure 13). The HQI predicted a similar trout biomass (11 kg/ha). An additional 300 m of stream was electrofished to obtain 30 Bonneville cutthroat trout for genetic analysis. The 30 cutthroat trout whole fish samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office during the winter/spring of 2000. Middle Fork had not been surveyed before by the UDWR.

### High

The stream survey on Middle Fork (high) was completed on July 20, 1999. This 100 m survey began approximately 300 m downstream of a private pond. UTMs for this station were: 4523147N and 0495923E.

Two-pass electrofishing resulted in the capture of 1 age-1 or older Bonneville cutthroat trout ( $10 \pm 0$ /stream km [ $16 \pm 0$ /stream mile] (Table 11; Figure 13); 4 kg/ha [4 lb/acre] and 2 age-1 or older brook trout ( $20 \pm 0$ /stream km [ $32 \pm 0$ /stream mile] (Figure 13); 16 kg/ha [14 lb/acre]). The two brook trout caught had escaped from the private pond located directly upstream from this electrofishing station. The landowner was contacted to repair the outflow screen for this pond to prevent further escapement of brook trout into Middle Fork. The two brook trout were returned to the private pond. HQI was not completed for this station.

One cutthroat trout fin clip was preserved in alcohol according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). This sample will be submitted to the Salt Lake Office in the winter/spring of 2000. Additional efforts to collect cutthroat trout from Middle Fork (high) were not pursued because a complete sample was obtained from Middle Fork (low). This section of the Middle Fork had not been previously sampled before by the UDWR.

Table 11. Population statistics for Bonneville cutthroat trout sampled in Middle Fork, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999 low	154 (247)	19 (16)	156(83-345)	63(6-389)	1.08
1999 high	10 (16)	4 (4)	199	86	1.09

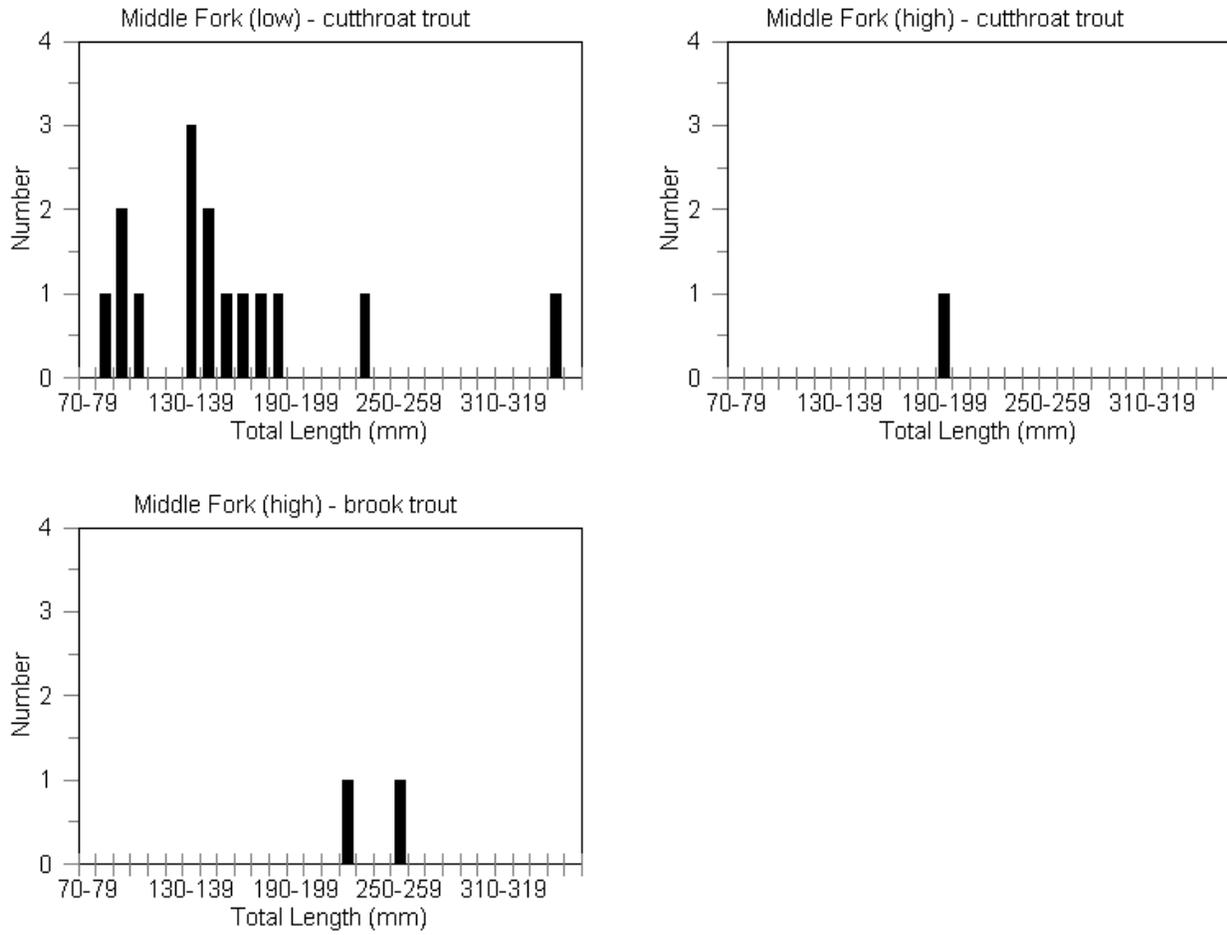


Figure 13. Size distribution of cutthroat trout and brook trout sampled in Middle Fork, 1999.

**unnamed tributary****IVAP230M02 01**

This unnamed tributary section 01 (confluence with the East Fork of Chalk Creek upstream to the headwaters) is a tributary to the East Fork of Chalk Creek. IVAP230M02 is in Summit County (Red Hole USGS Quad) with the entire drainage being private. Fish species present in IVAP230M02 are Bonneville cutthroat trout and mountain sucker. Mottled sculpin may also be present in the lower reaches of the stream. No barrier exists to prevent the upstream movement of fish from the East Fork of Chalk Creek.

The stream survey on IVAP230M02 was completed on July 28, 1999. Section 01 was surveyed with one 100 m station located at the road crossing. UTM's for this station were: 4529734N and 0494093E. IVAP230M02 is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 26 age-1 or older Bonneville cutthroat trout ( $272 \pm 10$ /stream km [ $437 \pm 16$ /stream mile] (Table 12; Figure 14); 30 kg/ha [27 lb/acre]) and one mountain sucker ( $10 \pm 0$ /stream km;  $16 \pm 0$ /stream mile). The majority of cutthroat trout were age-1 fish (Figure 14), indicating that this stream is utilized as a spawning tributary to the East Fork of Chalk Creek. No HQI was completed on IVAP230M02. An additional 100 m of stream was electrofished to obtain 30 Bonneville cutthroat trout (10 whole, 20 fin clips) for genetic analysis. The 30 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. IVAP230M02 had not been sampled before by the UDWR.

Table 12. Population statistics for Bonneville cutthroat trout sampled in IVAP230M02, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	272 (437)	30 (27)	102(66-295)	22(2-279)	1.08

## IVAP230M02

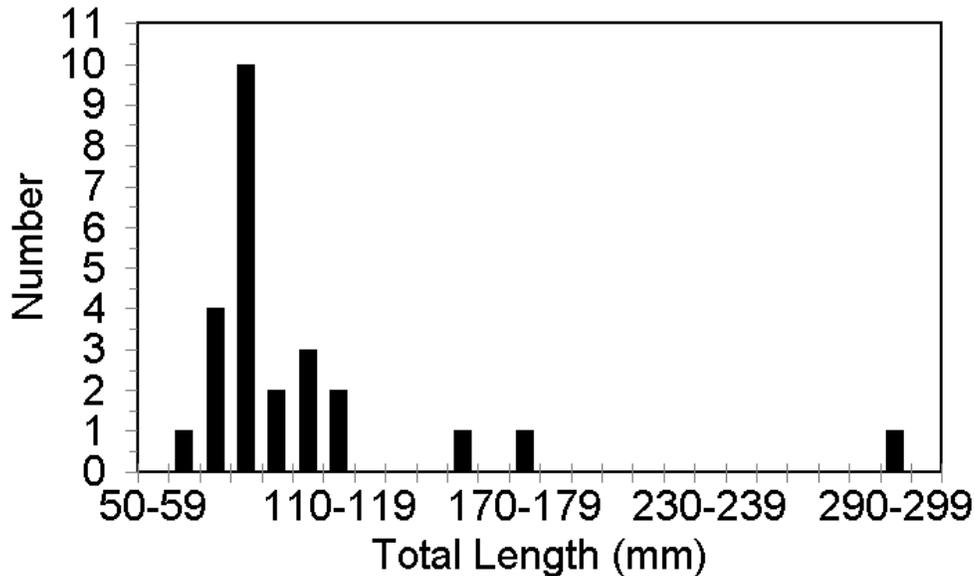


Figure 14. Size distribution of cutthroat trout sampled in IVAP230M02, 1999.

### unnamed tributary

### IVAP230M03 01

This unnamed tributary section 01 (confluence with the East Fork of Chalk Creek upstream to the headwaters) is a tributary to the East Fork of Chalk Creek. IVAP230M03 is in Summit County (Red Hole USGS Quad) with the entire drainage being private. No fish were sampled in IVAP230M03, however Bonneville cutthroat trout are likely present in the lower 200 m of this stream. No known barrier exists to prevent the upstream movement of fish from the East Fork of Chalk Creek, however the absence of fish 400 m upstream from the confluence might indicate that a natural barrier exists.

The stream survey on IVAP230M03 was completed on July 28, 1999. Section 01 was surveyed with one 100 m station located at the road crossing. UTMs for this station were: 4529326N and 0496713E. One-pass electrofishing resulted in the capture of no fish. IVAP230M03 had not been previously sampled by the UDWR.

## Red Hole

IVAP230M01A 01

Red Hole section 01 (confluence with Middle Fork upstream to the headwaters) is a tributary to Middle Fork. Red Hole is in Summit County (Red Hole USGS Quad) with the entire drainage being private. Fish species present in Red Hole are Bonneville cutthroat trout. All cutthroat trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. Red Hole is classified as a IVB fishery for Bonneville cutthroat trout. A diversion barrier exists just upstream from the road crossing which would prevent the upstream movement of fish from Middle Fork during low flows.

### Low

The stream survey on Red Hole (low) was completed on July 21, 1999. This 100 m station began approximately 30 m upstream from the diversion. UTM's for this station were: 4528242N and 0492456E.

Two-pass electrofishing resulted in the capture of 4 age-1 or older Bonneville cutthroat trout ( $40 \pm 0$ /stream km [ $64 \pm 0$ /stream mile] (Table 13; Figure 15); 52 kg/ha [46 lb/acre]). All cutthroat trout were adult fish (Figure 15) indicating that this stream is not utilized for spawning. No HQI was completed on Red Hole (low). An additional 150 m of stream was electrofished, however only one more cutthroat trout was obtained. Fin clips were collected from the 5 Bonneville cutthroat trout for genetic analysis. The 5 cutthroat trout fin clips were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office during the winter/spring of 2000. Red Hole (low) had not previously been sampled by the UDWR.

### High

The stream survey on Red Hole (high) was completed on July 21, 1999. This 100 m station began at the end of the 4WD road in a depression with red soil, hence the name Red Hole. UTM's for this station were: 4527392N and 0492257E.

Two-pass electrofishing resulted in the capture of 2 age-1 or older Bonneville cutthroat trout ( $20 \pm 0$ /stream km [ $32 \pm 0$ /stream mile] (Table 13; Figure 15); 18 kg/ha [16 lb/acre]). All cutthroat trout were adult fish (Figure 15) indicating that this stream is not utilized for spawning. No HQI was completed on Red Hole (high). Attempts were not made at collecting additional cutthroat trout for genetic analysis. Fin clips were collected from the 2 Bonneville cutthroat trout and these fin clips were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office during the winter/spring of 2000. Red Hole (high) had not previously been sampled by the UDWR.

Table 13. Population statistics for Bonneville cutthroat trout sampled in Red Hole, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999 low	40 (64)	52 (46)	256(215-314)	194(118-293)	1.14
1999 high	20 (32)	18 (16)	230(209-250)	133(103-163)	1.09

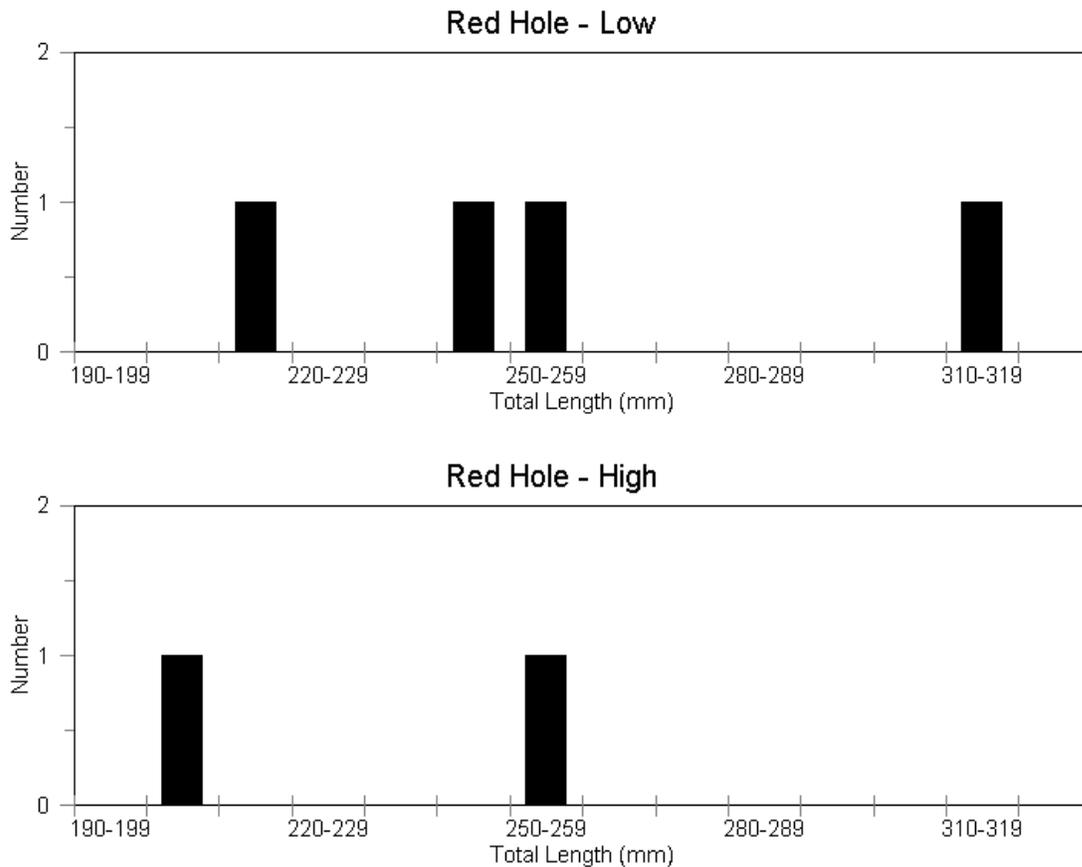


Figure 15. Size distribution of cutthroat trout sampled in Red Hole, 1999.

**Mill Fork****IVAP230M01B 01**

Mill Fork section 01 (confluence with Middle Fork upstream to the headwaters) is a tributary to Middle Fork. Mill Fork is in Summit County (Red Hole and Slader Basin USGS Quads) with the entire drainage being private. Fish species present in Mill Fork are Bonneville cutthroat trout. No barrier exists to prevent the upstream movement of fish from Middle Fork.

The stream survey on Mill Fork was completed on July 19, 1999. Section 01 was surveyed with one 100 m station located above the road crossing. UTMs for this station were: 4523558N and 0492321E. Mill Fork is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 13 age-1 or older Bonneville cutthroat trout (143 ± 41/stream km [230 ± 66/stream mile] (Table 14; Figure 16); 20 kg/ha [18 lb/acre]). Although age classes are not readily distinguishable, several age classes of cutthroat trout were present in the sample, including age-1 fish (Figure 16). Mill Fork appears to contribute to the spawning metapopulation in the East Fork of Chalk Creek. HQI predicted a considerably higher trout biomass (282 kg/ha), however, Mill Fork is a high elevation, relatively unproductive stream that will not support larger sized trout. An additional 250 m of stream was electrofished to obtain 30 Bonneville cutthroat trout for genetic analysis. The 30 whole cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. Mill Fork had not been sampled before by the UDWR.

Table 14. Population statistics for Bonneville cutthroat trout sampled in Mill Fork, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	143 (230)	20 (18)	142(44-274)	53(0.5-226)	1.06

# Mill Fork

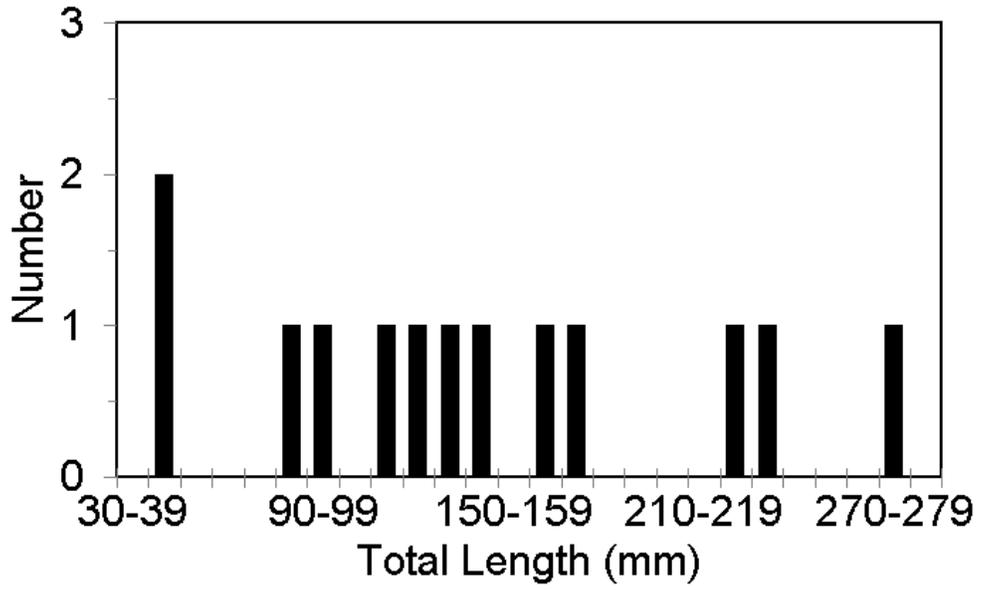


Figure 16. Size distribution of cutthroat trout sampled in Mill Fork, 1999.

**unnamed tributary****IVAP230M01B02 01**

This unnamed tributary section 01 (confluence with Mill Fork upstream to the headwaters) is a tributary to Mill Fork. IVAP230M01B02 is in Summit County (Red Hole and Slader Basin USGS Quads) with the entire drainage being private. Fish species present in IVAP230M01B02 are Bonneville cutthroat trout. No barrier exists to prevent the upstream movement of fish from Mill Fork.

The stream survey on IVAP230M01B02 was completed on July 19, 1999. Section 01 was surveyed with one 100 m station located at the bend in the road where the stream leaves the road. UTMs for this station were: 4526471N and 0493862E. IVAP230M01B02 is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 18 age-1 or older Bonneville cutthroat trout (180 ± 0/stream km [290 ± 66/stream mile] (Table 15; Figure 17); 30 kg/ha [27 lb/acre]). Although age classes are not readily distinguishable, the majority of fish appear to be age-2 and age-3, indicating that IVAP230M01B02 contributes to the spawning metapopulation in the East Fork of Chalk Creek. HQI predicted a considerably higher trout biomass (147 kg/ha), however, IVAP230M01B02 is a high elevation, relatively unproductive stream that will not support larger sized trout. An additional 30 m of stream was electrofished to obtain 30 Bonneville cutthroat trout for genetic analysis. The 30 whole cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. IVAP230M01B02 had not been sampled before by the UDWR.

Table 15. Population statistics for Bonneville cutthroat trout sampled in IVAP230M01B02, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	180 (290)	30 (27)	161(94-287)	59(9-229)	1.11

# IVAP230M01B02

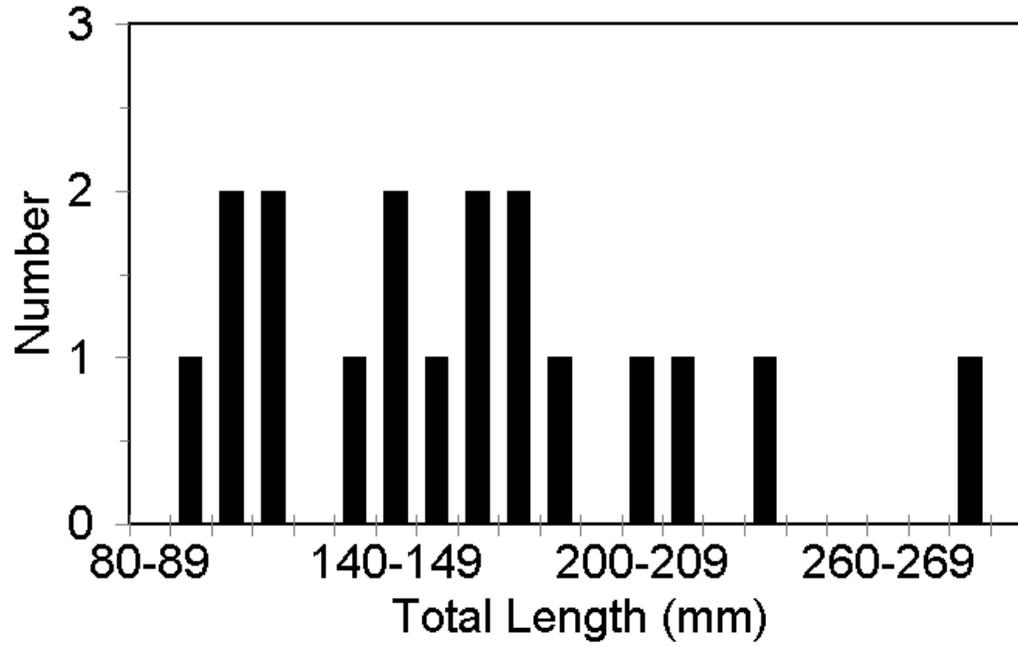


Figure 17. Size distribution of cutthroat trout sampled in IVAP230M01B02, 1999.

### **Chalk Creek section 03**

**IVAP230 03**

Chalk Creek section 03 (East Fork of Chalk Creek confluence upstream to the headwaters) is in Summit County (Red Hole, Porcupine Ridge, and Seven Tree Flat USGS Quads) with the entire section being private. Fish species present in Chalk Creek section 03 are Bonneville cutthroat trout, mottled sculpin, longnose dace, speckled dace, mountain sucker, and redbreast shiner. Between 500-1,000 rainbow trout catchables were stocked annually at bridge crossings in Chalk Creek until 1998, consequently, rainbow trout may be present in the lower reaches of this section. Despite the stocking history in the drainage, all trout caught in 1999 phenotypically looked like Bonneville cutthroat trout. No barrier prevents the upstream movement of fish from Chalk Creek section 02. Chalk Creek section 03 is a class IVB fishery for Bonneville cutthroat trout.

#### Low

The stream survey in this station was completed on July 15, 1999 approximately 0.8 km downstream from Aagards drive. UTM coordinates for this station were: 4536170N and 0493245E. The length of the electrofished station was 100 m.

Two-pass electrofishing resulted in the capture of 3 age-1 or older Bonneville cutthroat trout ( $40 \pm 70$ /stream km [ $64 \pm 112$ /stream mile]) (Table 16; Figure 18); 27 kg/ha [24 lb/acre], >40 redbreast shiner, >20 mountain sucker, >70 speckled dace, and longnose dace were present. The only population estimate available was Bonneville cutthroat trout because some of the fish in the live cage from the first electrofishing pass escaped before they were counted. The HQI predicted a higher trout biomass (49 kg/ha), however, more trout were likely present in this stream reach than what was caught. This reach contained extremely deep pools that made choosing an electrofishing station difficult. Even within the station, deep water made netting all fish difficult. An additional 1.5 km of stream was electrofished to obtain 15 cutthroat trout (10 whole, 5 fin clips). More trout were present, but escaped being caught. These samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999) and will be submitted to the Salt Lake Office in the winter/spring of 2000. Chalk Creek section 03 (low) had not been surveyed before by the UDWR.

#### Medium

The stream survey in this station was completed on July 12, 1999. The station started immediately upstream from the unnamed tributary, IVAP230S. UTM coordinates for this station were 4537433N and 0497924E. The length of the electrofished station was 104 m.

Two-pass electrofishing resulted in the capture of 4 age-1 and

older Bonneville cutthroat trout ( $39 \pm 0$ /stream km [ $62 \pm 0$ /stream mile] (Table 16; Figure 18); 17 kg/ha [15 lb/acre]), 239 redbside shiner ( $3255 \pm 751$ /stream km;  $5238 \pm 1209$ /stream mile), 72 mountain sucker ( $1924 \pm 3204$ /stream km;  $3096 \pm 5155$ /stream mile), 188 speckled dace, and 1 longnose dace ( $9 \pm 0$ /stream km;  $15 \pm 0$ /stream mile). More speckled dace were caught on the second electrofishing pass, consequently, a population estimate was not available. The HQI predicted a similar trout biomass (20 kg/ha). An additional 1 km of stream was electrofished to obtain 31 cutthroat trout (10 whole, 21 fin clips). These samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999) and will be submitted to the Salt Lake Office in the winter/spring of 2000. Chalk Creek section 03 (medium) had not been surveyed before by the UDWR.

#### High

The stream survey in this station was completed on July 27 1999. This station began at the 4WD road crossing. UTM's for this station were: 4531259N and 0502827E. The length of the electrofished station was 99 m.

Two-pass electrofishing resulted in the capture of 73 age-1 and older Bonneville cutthroat trout ( $774 \pm 60$ /stream km [ $1245 \pm 97$ /stream mile]; 34 kg/ha [30 lb/acre]); Table 16; Figure 18) and 13 mottled sculpin ( $163 \pm 102$ /stream km;  $263 \pm 164$ /stream mile). The HQI predicted a similar trout biomass (38 kg/ha). Several age classes of Bonneville cutthroat trout were present in the sample, including age-1 and age-2 fish (Figure 18), indicating that the headwater reaches of Chalk Creek contribute to the spawning Bonneville cutthroat trout metapopulation. Thirty whole cutthroat trout were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. Chalk Creek section 03 (high) had not been previously surveyed before by the UDWR.

Table 16. Population statistics for Bonneville cutthroat trout sampled in section 03 of Chalk Creek, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999 low	40 (64)	27 (24)	293(209-391)	320(91-644)	1.04
1999 med	39 (62)	17 (15)	235(200-292)	173(88-351)	1.18
1999 high	774 (1245)	34 (30)	121(62-216)	24(2-107)	0.98

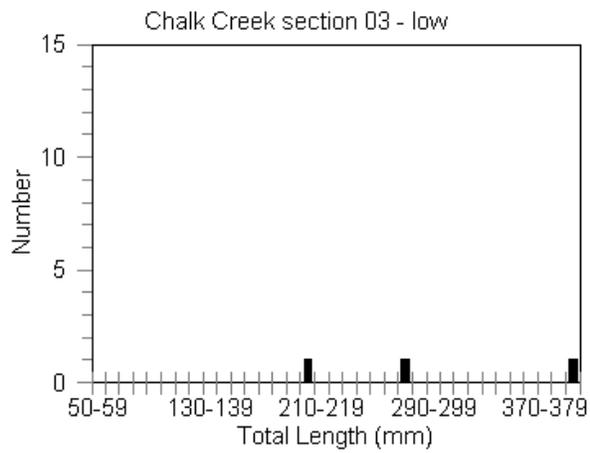
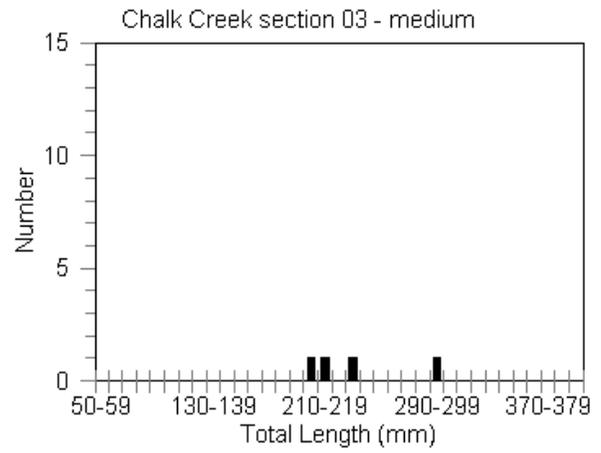
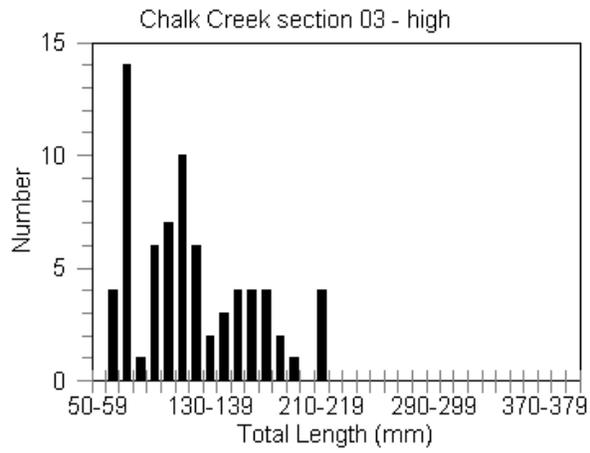


Figure 18. Size distribution of cutthroat trout sampled in Chalk Creek section 03, 1999.

**unnamed tributary****IVAP230N 01**

IVAP230N section 01 (confluence with Chalk Creek section 03 upstream to the headwaters) is a tributary to Chalk Creek section 03. IVAP230N is in Summit County (Red Hole USGS Quad) with the entire drainage being private. IVAP230N was spot electrofished on July 27, 1999. Spot electrofishing 100 m of stream at 4537320N and 0494533E resulted in mountain sucker, speckled dace, and redbside shiner. Stream flows in IVAP230N were conducive to a resident Bonneville cutthroat trout population, however none were observed while spot shocking. Bonneville cutthroat trout may utilize IVAP230N during some years. No barrier exists for the upstream movement of fish from Chalk Creek section 03.

**unnamed tributary****IVAP230R 01**

IVAP230R section 01 (confluence with Chalk Creek section 03 upstream to the headwaters) is a tributary to Chalk Creek section 03. IVAP230R is in Summit County (Red Hole USGS Quad) with the entire drainage being private. IVAP230R was spot electrofished at three localities on July 27, 1999. The upper location electrofished (4535475N and 0495879E) resulted in numerous mountain sucker and some speckled dace and redbside shiner. Spot shocking at 4536241N and 496316E resulted in numerous mountain sucker, redbside shiner, and speckled dace. The lowest location electrofished (4537546N and 0496485E) also produced numerous mountain sucker, redbside shiner, and speckled dace. IVAP230R was walked at the road crossing on the Utah/Wyoming border and very little stream flow was observed. It appears that IVAP230R flows underground before the confluence with Chalk Creek section 03, which may limit this stream from being utilized by Bonneville cutthroat trout.

**unnamed tributary****IVAP230S 01**

This unnamed tributary section 01 (confluence with Chalk Creek section 03 upstream to the headwaters) is a tributary to Chalk Creek section 03. IVAP230S is in Summit County (Red Hole USGS Quad) with the entire drainage being private. Fish species present in IVAP230S are Bonneville cutthroat trout. Speckled dace, redbside shiner, and mountain sucker are probably present in the lower reaches of the stream. No barrier exists to prevent the upstream movement of fish from Chalk Creek section 03.

The stream survey on IVAP230S was completed on July 9, 1999. Section 01 was surveyed with one 100 m station located at a 4WD road crossing. UTMs for this station were: 4534879N and 0497486E. IVAP230S is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 7 age-1 or older Bonneville cutthroat trout (70 ± 0/stream km [113 ±

0/stream mile] (Table 17; Figure 19); 40 kg/ha [35 lb/acre]. All Bonneville cutthroat trout were adult fish, therefore IVAP230S does not likely contribute extensively as a spawning tributary. HQI predicted a similar trout biomass (35 kg/ha). An additional 500 m of stream was electrofished to obtain 31 Bonneville cutthroat trout (10 whole, 21 fin clips) for genetic analysis. The 31 cutthroat trout samples were frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999). These samples will be submitted to the Salt Lake Office in the winter/spring of 2000. IVAP230S had not been sampled before by the UDWR.

Table 17. Population statistics for Bonneville cutthroat trout sampled in IVAP230S, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	70 (113)	40 (35)	175(150-217)	66(41-109)	1.19

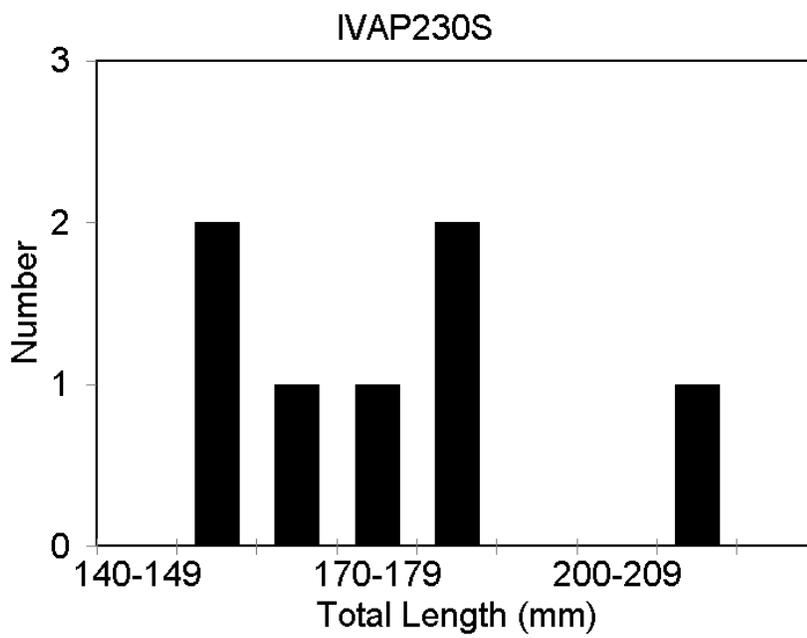


Figure 19. Size distribution of cutthroat trout sampled in IVAP230S, 1999.

**unnamed tributary****IVAP230S01 01**

This unnamed tributary section 01 (confluence with IVAP230S upstream to the headwaters) is a tributary to IVAP230S. IVAP230S01 is in Summit County (Red Hole USGS Quad) with the entire drainage being private. Fish species present in IVAP230S01 are Bonneville cutthroat trout. No barrier exists to prevent the upstream movement of fish from IVAP230S.

The stream survey on IVAP230S01 was completed on July 9, 1999. Section 01 was surveyed with one 100 m station located just downstream of a 4WD road crossing. UTM's for this station were: 4534088N and 0496312E. IVAP230S01 is classified as a IVB fishery for Bonneville cutthroat trout.

Two-pass electrofishing resulted in the capture of 9 age-1 or older Bonneville cutthroat trout (120 ± 120/stream km [193 ± 193/stream mile] (Table 18; Figure 20); 68 kg/ha [61 lb/acre]. All Bonneville cutthroat trout were adult fish, therefore IVAP230S01 does not likely contribute extensively as a spawning tributary. HQI was not completed on IVAP230S01. No attempts were made at collecting additional cutthroat trout for genetic analysis because a complete sample was obtained from IVAP230S. In fact, only a fin clip from a single cutthroat trout was taken for genetic analysis. The 1 cutthroat trout fin clip was frozen according to the cutthroat trout collection procedural manual (Toline and Lentsch 1999) and will be submitted to the Salt Lake Office in the winter/spring of 2000. This sample should be included with the samples from IVAP230S. IVAP230S01 had not been sampled before by the UDWR.

Table 18. Population statistics for Bonneville cutthroat trout sampled in IVAP230S01, 1999.

Year	#/km (#/mile)	kg/ha (lb/acre)	Avg TL(mm)	Avg WT(g)	Avg K
1999	120 (193)	68 (61)	145(108-230)	41(10-134)	1.02

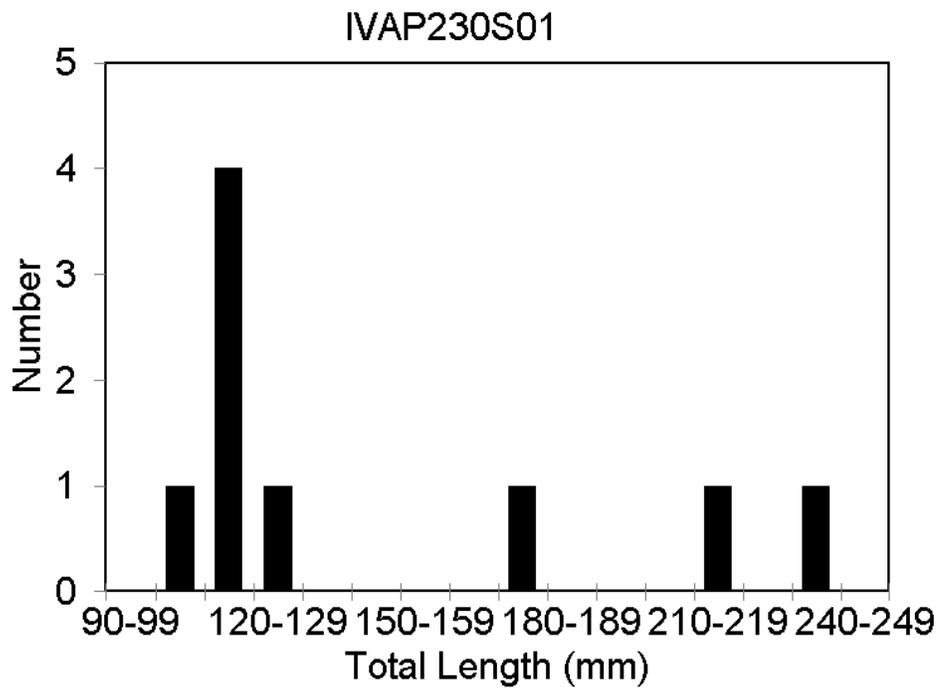


Figure 20. Size distribution of cutthroat trout sampled in IVAP230S01, 1999.

## DISCUSSION

### **Bonneville cutthroat trout metapopulation status**

Twenty-five stream surveys were completed on 17 streams/stream sections in the Chalk Creek Drainage that contained cutthroat trout (Table 1; Figure 1). Based on these 25 stream surveys, Bonneville cutthroat trout occupy 167 stream kilometers (103 stream miles) in the Chalk Creek Drainage (Table 1). Stream surveys were completed on most streams/stream sections in Chalk Creek, however, other streams in the drainage likely contain Bonneville cutthroat trout. Bonneville cutthroat trout are known to occur in Chalk Creek section 01 (UDWR, unpublished data) and Florence Creek (IVAP230T) (Bob Witt, UDWR, personal communication). Bonneville cutthroat trout may also be in Basin Creek (IVAP230Q), Porcupine Creek (IVAP230L), as well as other streams.

The Bonneville cutthroat trout metapopulation in the Chalk Drainage represents the largest metapopulation remaining in Utah, at least in the number of occupied stream miles. This metapopulation may even be the largest remaining within the Bonneville cutthroat trouts' historic range. With the surveys completed in 1998-1999, 17 additional streams/stream sections can be added to the Utah Bonneville cutthroat trout Conservation Strategy (Lentsch et al. 1997) and pending genetic analyses, the potential exists to add 167 stream km (103 stream miles) towards conservation populations of Bonneville cutthroat trout to the Strategy.

### **Non-native trout**

Brown trout and rainbow trout occur in Chalk Creek section 01 (UDWR, unpublished data), however the diversion barrier (Figure 2) located 4 km upstream from the town of Coalville appears to be preventing these fish from moving upstream. Approximately 500-1000 rainbow trout catchables were stocked annually until 1998 at bridge crossings in Chalk Creek section 02, however, no rainbow trout were sampled in 1998 or 1999. These fish may have hybridized with Bonneville cutthroat trout through time, however, all cutthroat trout caught during the surveys resembled Bonneville cutthroat trout, therefore past hybridization appears to be minimal, if not negligible.

Rainbow trout and brook trout are currently being stocked in private ponds in the East Fork of Chalk Creek, and likely in private ponds in other parts of the Chalk Creek Drainage. By law, inflow and outflow channels to private ponds are to be adequately screened to prevent the escapement of fish from the ponds. Several ponds inspected in the East Fork of Chalk Creek Drainage, however, no longer had functional screens. This

resulted in the presence of the only non-native salmonids (2 brook trout) sampled in the Chalk Creek Drainage upstream from the diversion barrier. At present, discussions with landowners are ongoing to help maintain screens on private ponds in Chalk Creek. Based on discussions with landowners in the East Fork of Chalk Creek, brook trout appear to be reproducing in two reservoirs, Joyce and Boyer reservoirs. These fish, if they are escaping, have not become established in any streams and they likely will not become established as the private ponds and reservoirs have been stocked for between 50-100 years.

All cutthroat trout caught in 1998 and 1999 surveys phenotypically resembled Bonneville cutthroat trout. Nuclear, molecular, and meristic analyses of tissue samples collected will definitively describe the genetic makeup of the Bonneville cutthroat trout in the Chalk Creek Drainage. At present time, these cutthroat trout should be considered to represent the historic genetic makeup of the Bonneville cutthroat trout that evolved in the Chalk Creek system.

#### **RECOMMENDATIONS**

- 1) Update the Conservation Strategy for Bonneville cutthroat trout in Utah based on information gained in the 1998-1999 stream surveys.
- 2) Complete genetic analyses on tissue samples collected in 1998-1999 surveys to determine if rainbow trout influence is in the Chalk Creek Bonneville cutthroat trout metapopulation.
- 3) Continue efforts to work with private pond owners to keep ponds adequately screened.

#### LITERATURE CITED

- Binns, N. A. 1982. Habitat quality index procedures manual. Wyoming Game and Fish Department, Cheyenne, Wyoming.
- Lentsch, L., Y. Converse, and J. Perkins. 1997. Conservation agreement and strategy for Bonneville cutthroat trout (*Oncorhynchus clarki utah*) in the State of Utah. Publication Number 97-19. Utah Department of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah.
- Reynolds, J. B. 1989. Electrofishing. Pages 147-163 in L. A. Nielsen and D. L. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.
- Toline, C. A. and L. D. Lentsch. 1999. Guidelines and protocols for identification and designation of populations of native cutthroat trout. Final report submitted to the Utah Division of Wildlife Resources. Utah State University, Logan, Utah.
- Witt, R. 1999. Personal communication. Utah Division of Wildlife Resources, Northern Regional Office, Ogden, Utah.
- Zippin, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22:82-90.