

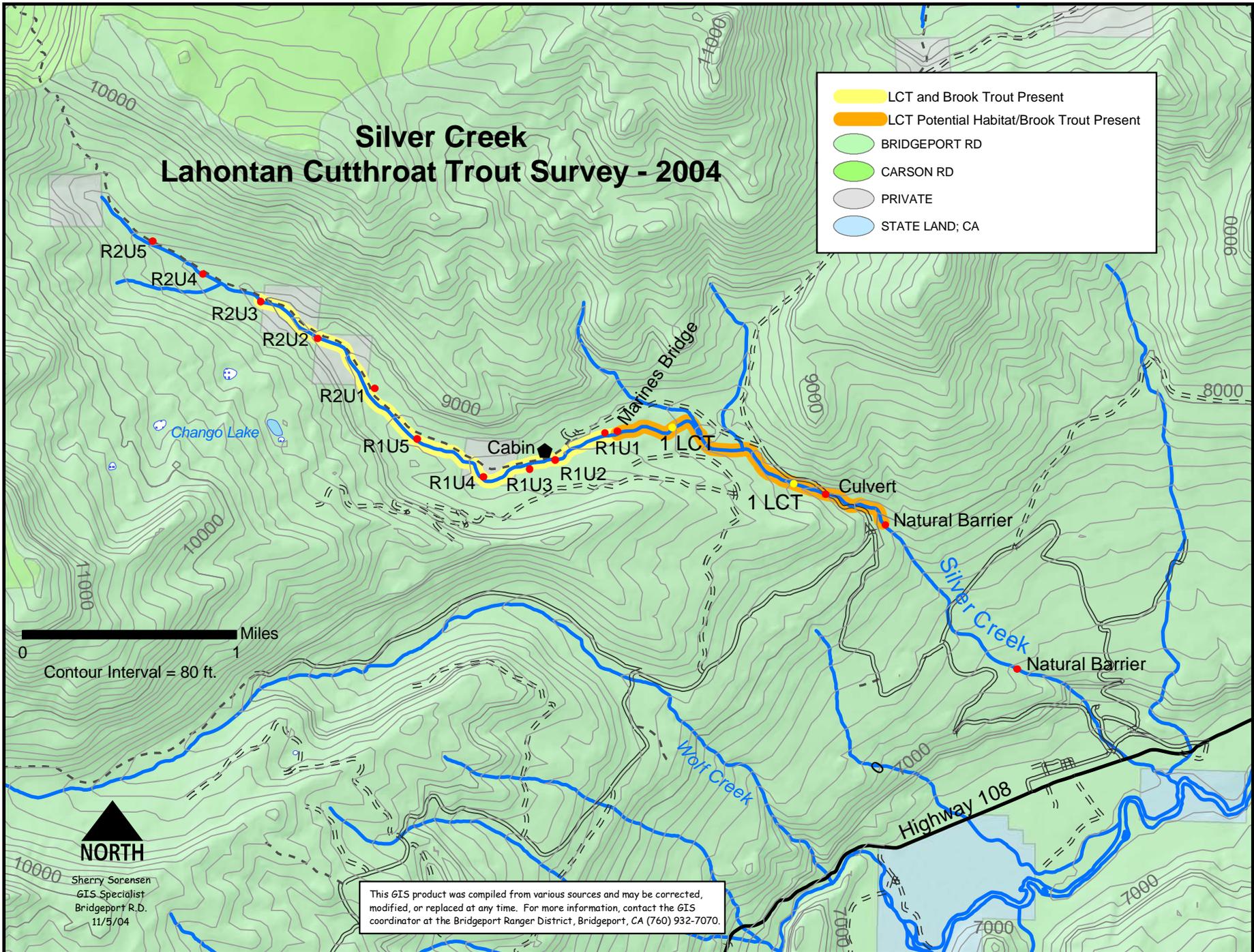
Silver Creek
Mono County, California

2004 Fish & Habitat Survey Report



Prepared by:

Bridgeport Ranger District
Humboldt-Toiyabe National Forest



Introduction

Silver Creek, Mono County, California, Bridgeport Ranger District, supports an introduced population of Lahontan cutthroat trout (LCT), a federally endangered species. Silver Creek is located in northern Mono County, California on the east slope of the Sierra Nevada mountain range. Silver Creek flows for approximately 6 miles in an easterly direction to its confluence with the West Walker River near the Mountain Warfare Training Center located on Highway 108. The Silver Creek watershed ranges from 6800 feet elevation to 9600 feet elevation. Although most of the watershed is managed by the Humboldt-Toiyabe National Forest (HTNF), a few small parcels are located on private land. Due to the close proximity of the Mountain Warfare Training Center, the Marines use the Silver Creek watershed as a training area. The Silver Creek watershed has been established as a Critical Aquatic Refuge in the 2004 Sierra Nevada Forest Plan Amendment.

Silver Creek was chemically treated with rotenone in 1994, 1995, and 1996. In 1997, 78 LCT were released into Silver Creek. In 1998, an additional 102 LCT were released into Silver Creek. The first LCT electrofishing survey on Silver Creek was conducted in 2004. Visual surveys were conducted in 1998, 1999, 2000, and 2001.

In an effort to document LCT distribution, density, and genetic composition, the HTNF, California Department of Fish and Game (CDFG), and the U.S. Fish and Wildlife Service (USFWS) decided to conduct fish distribution and density surveys in Silver Creek. Surveys were conducted in September of 2004.

Methodology

The mainstem of Silver Creek was broken into two reaches. Each reach had similar habitats, so each reach was divided into similar lengths. Each reach was approximately 1.5 miles in length. The fish sampling crew spot shocked from the upper natural barrier (just downstream of the culvert) to the Marines bridge and found very few LCT. Just upstream of the Marines bridge LCT densities quickly increased; therefore, just upstream of the marines bridge is where Reach 1 started. Due to the high gradient, the area between the two natural barriers was not surveyed for presence of fish.

Each of the two reaches was separated into 5 evenly spaced units. Units 1, 2, 3, and 5 were 40 meters in length. Unit 4 was 100 meters in length. A backpack electroshocker was used to sample these units. Units 1, 2, 3, and 5 were sampled with one pass. Unit 4 was sampled with three passes. Block nets were used at the upstream and downstream ends of each 100 meter long unit sampled. Block nets were not used on the 40 meter long units sampled.

Appendix 1 contains raw data filled out for each unit sampled. A new data form was prepared for each unit sampled. A Trimble GPS unit was used to document unit locations. The GPS locations were taken at the downstream (bottom) end of each unit. Unit length (measured), average width (to the closest 1/10 meter), and average depth (to the closest 1/10 meter) were recorded for each unit.

Notes regarding habitat quality/quantity, observations, morphological characteristics, management concerns, restoration opportunities, etc were recorded in the comments section.

A small piece of caudal fin was clipped from 26 different LCT and placed in separate envelopes to dry. Genetic samples were collected from each unit sampled to obtain spatial variation in the samples. Fin clips were also collected from different length LCT to obtain age class variation. These samples were given to Dr. Mary Peacock at University of Nevada Reno for genetic analysis.

Photographs were taken at the upstream and downstream ends of each unit (looking upstream and downstream) and of important/interesting features.

Results

The distribution of LCT within the Silver Creek watershed is limited to approximately 3.3 miles of Silver Creek. The distribution is limited to Reach 1 and Reach 2 Units 1, 2, and 3 (Figures 2 & 3). While spot-shocking, only two LCT were found downstream of Reach 1. The highest density of LCT is between Reach 1 Unit 1 and Reach 2 Unit 1. The length of LCT ranges from 45 to 261 mm total length with the average total length of LCT being 182 mm (Figure 1). The length frequency histogram (Figure 1) suggests that multiple age classes of LCT are found within the Silver Creek watershed.

The mean number of LCT caught between Reach 1 Unit 1 and Reach 2 Unit 1 is 1144 (Figure 4). The upper 90% confidence interval is 1515 and the lower 90% confidence interval is 772 (Figure 4). The distance between Reach 1 Unit 1 and Reach 2 Unit 1 is approximately 2.2 miles. The mean number of LCT caught within the entire watershed of Silver Creek is 1186 (Figure 5). The upper 90% confidence interval is 1558 and the lower 90% confidence interval is 815 (Figure 5). The mean number of LCT/mile within the entire Silver Creek watershed is 359 (Figure 6). The upper 90% confidence interval is 472 and the lower 90% confidence interval is 247 (Figure 6).

An unexpected population of non-native Brook trout was found in Silver Creek. Brook trout were dispersed throughout the Silver Creek watershed between the upper natural barrier and Reach 2 Unit 3. While conducting this survey Brook trout were spawning. Approximately 450 Brook trout ranging from 2 to 10 inches in total length were captured between the upper natural barrier and Reach 2 Unit 3 thus indicating a large self-sustaining population of Brook trout in Silver Creek.

A HOBO Temperature (C) 1996 Onset data logger was used to collect temperature data in Silver Creek. The HOBO Temp was located within Reach 1 Unit 4 at 8717 feet elevation. Temperature was collected from 30 Sept. 2003 to 26 Aug. 2004. The overall maximum temperature was 15.62 degrees Celsius, the overall average temperature was 3.27 degrees Celsius, and the overall minimum temperature was -0.61 degrees Celsius. The average temperature between 1 Nov. 2003 and 31 March 2004 was 0.04 degrees Celsius. The average temperature between 30 Sept. 2003 and 31 Oct. 2003, and between 1 April 2004 and 26 Aug. 2004 was 6.36 degrees Celsius (Figure 7).

The dominant overstory consisted of conifers, and the dominant understory consisted of grasses, sedges, and a few willows. The dominant Rosgen channel type is B with a few open meadow habitats characterized as Rosgen channel type C. The average width of Silver Creek is 3.4 meters and the average depth of Silver Creek is 0.20 meters.

Discussion

Lahontan cutthroat trout are unlikely to extend their distribution upstream of Reach 2 Unit 3 due to higher elevation, colder water temperatures, increased gradient, and lower water flows. However, LCT could likely extend their distribution downstream of the Marines bridge to the upper natural barrier if Brook trout were not present. The area between the upper natural barrier and the Marines bridge is suitable habitat for LCT. The large number of Brook trout present between the upper natural barrier and the Marines bridge may be the reason why only 2 LCT were found within that area.

The large self sustaining population of Brook trout is negatively impacting LCT survival in Silver Creek. Brook trout are known to prey upon and out-compete LCT for resources.

Cold water temperatures are probably negatively impacting LCT survival in Silver Creek. In 2003-2004 water temperatures were near zero for approximately 5 months during the year (Figure 7).

Stream habitat conditions in Silver Creek between the upper natural barrier and Reach 2 unit 3 are fairly good. Typical habitat consisted of riffles, pools, large boulders, several pieces of large woody debris in the stream, well vegetated stream banks, some good undercut cover, and not many bare or eroding banks.

Silver Creek between the Mountain Warfare Training Center and the upper natural barrier (Figures 8 & 9) is very high gradient. High velocity water, cascade plunge pools, waterfalls acting as fish barriers, and steep canyon hill slopes are typical for this area. The upper natural barrier (Figures 8 & 9) is located approximately 300 meters downstream of the Silver Creek (FS Road 059)/Wolf Creek (FS Road 042) intersection. The upper natural barrier is approximately 35 feet high. Several more fish barriers are found between the uppermost barrier and the Mountain Warfare Training Center. No fish surveys were conducted below the uppermost fish barrier.

Approximately ½ mile upstream from the Silver Creek (FS Road 059)/Wolf Creek (FS Road 042) intersection Forest Service Road 059 crosses Silver Creek to the North side and then parallels the stream for approximately 1.5 miles. At the end of the 1.5 miles the road ends and turns into a trail that continues paralleling Silver Creek. Several dispersed campsites are located within 100 feet of Silver Creek between Forest Service Road 059 and Silver Creek. Campsites appear to be used often. Where Forest Service Road 059 crosses Silver Creek to the North side, the road-stream crossing was constructed by installing two large culverts (Figures 10 & 11). Both culverts are not acting as fish barriers; however, waterbars need to be installed on Forest Service Road 059 near the road-stream crossing to divert runoff and reduce sediment impacts on Silver Creek.

Approximately 1 mile upstream from the two culverts the Marines constructed a bridge (Figures 12 & 13) in 2003. The 2004 Sierra Nevada Forest Plan Amendment states that new stream crossings and replacement stream crossings must be designed for at least the 100-year flood, including bedload and debris. The existing Marines bridge does not meet the road standards set forth by the 2004 Sierra Nevada Forest Plan Amendment. Some general road maintenance (waterbar construction, etc) near the Marines bridge also needs to occur to reduce sediment impacts on Silver Creek.

Impacts from electroshocking are a concern, and care was taken to limit LCT exposure to both handling and electrical currents. Lahontan cutthroat trout were closely monitored immediately after being netted. No obvious injuries to LCT were observed. The LCT appeared to respond well to the method of survey. No LCT mortality was documented.

Recommendations

1. Brook trout and LCT distribution and densities need to be continually monitored.
2. The appropriate actions need to be implemented to reduce or eliminate the threats and impacts of Brook trout on LCT.
3. Water temperature at different depths needs to be monitored.
4. All campsites within 100 feet of Silver Creek need to be decommissioned to reduce erosion impacts on LCT.
5. Waterbars need to be installed near the two culverts and near the Marines bridge to divert runoff and reduce sediment impacts on Silver Creek.
6. If LCT in the future are stocked into Silver Creek, consider restocking the LCT near Reach 1 Unit 3. Reach 1 Unit 3 occurs within a meadow habitat.
7. Once the genetic analysis is completed, implement actions consistent with the conclusions made from the analysis.

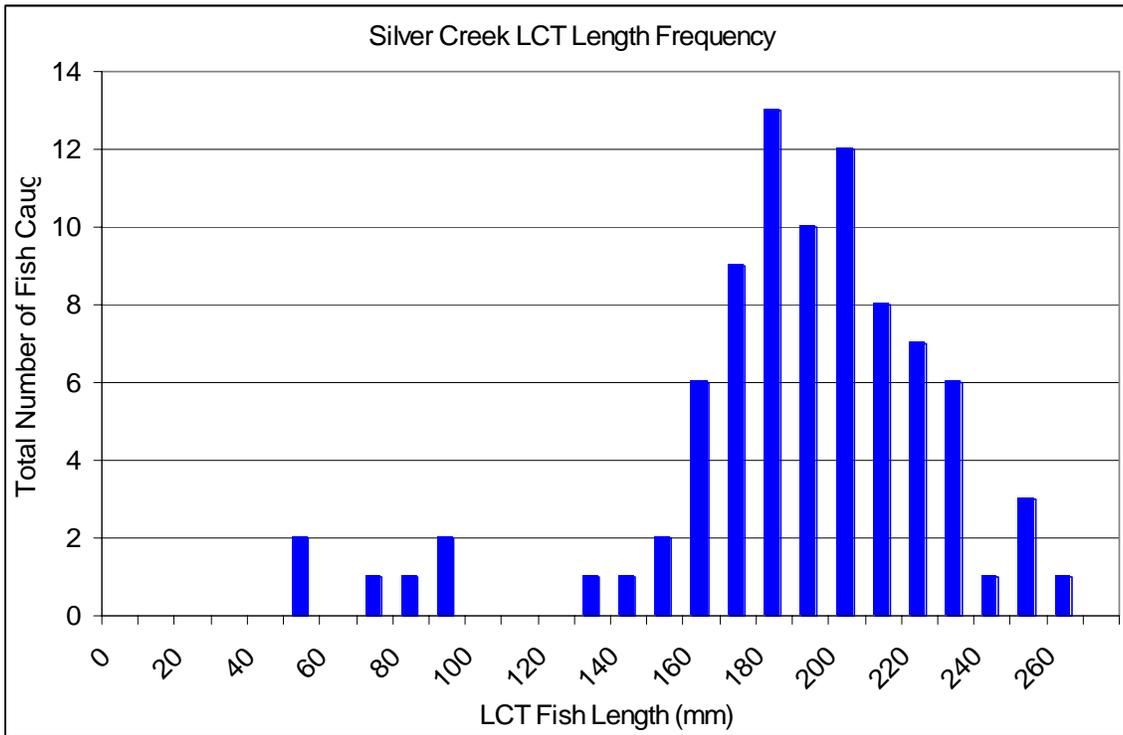


Figure 1: Length frequency of Lahontan cutthroat trout caught from Silver Creek, Bridgeport Ranger District. Silver Creek was surveyed on September 15, 16, 17, and 20 of 2004. The average total length of LCT is 182 mm (7 inches).

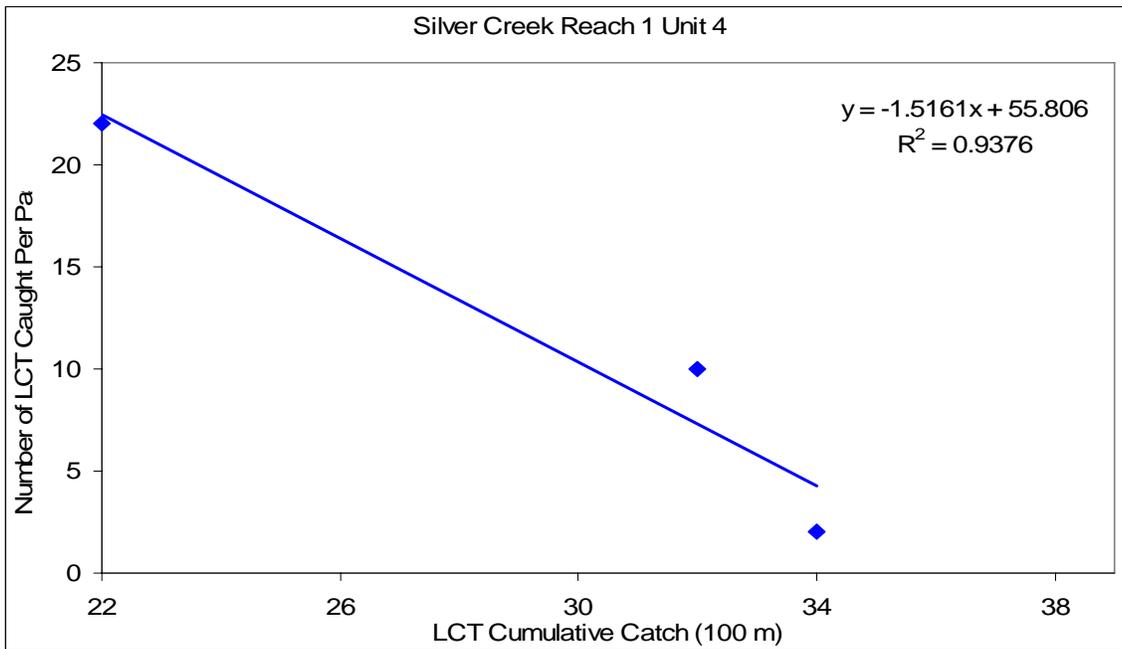


Figure 2: Linear regression equation for cumulative number of Lahontan cutthroat trout caught from Silver Creek, Bridgeport Ranger District, Reach 1/Unit 4. Using the linear regression equation, the estimated total number of LCT within Reach 1 Unit 4 is 37. Reach 1/Unit 4 was 100 meters long and was electroshocked three times. Block nets were set at the top and bottom of the unit to keep fish from entering and leaving the unit. Reach 1/Unit 4 is located at UTM N: 4250340.94 & E: 275710.07. Survey was conducted on 17 Sept. 2004. Twenty-two fish caught on the first pass is 59.5% of the estimated total number of LCT within Reach 1/Unit 4. No fish were caught from Reach 2/Unit 4; also a 100 meter long unit.

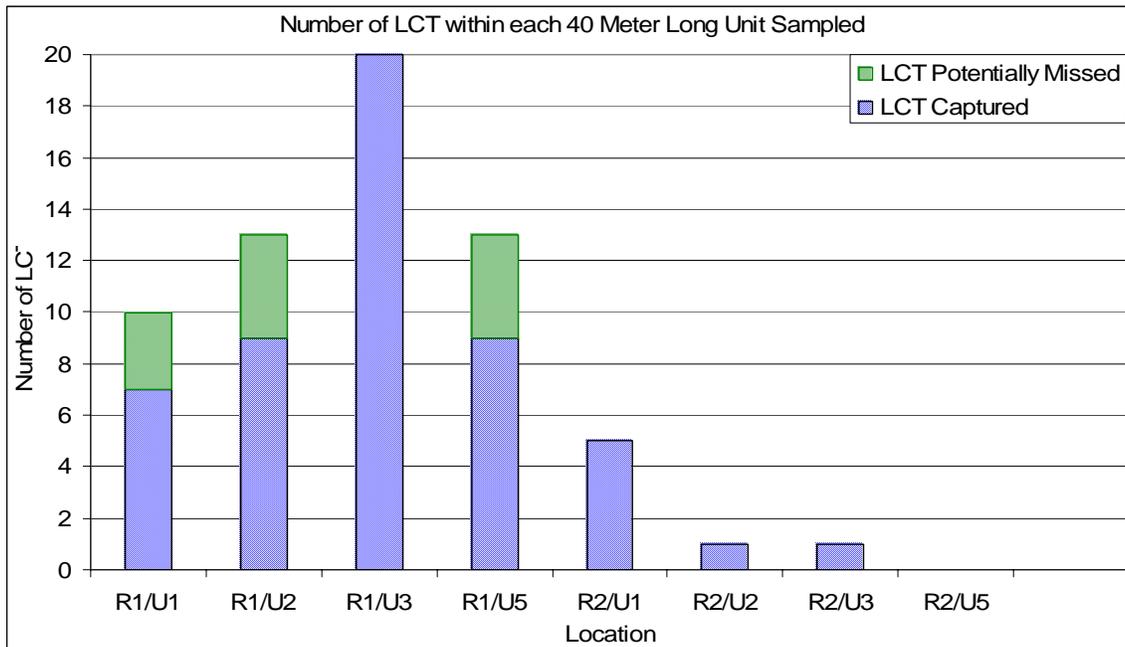


Figure 3: Number of LCT captured from each of the 40 meter long units sampled on Silver Creek, Bridgeport Ranger District. Surveys were conducted on September 15, 16, 17, and 20 of 2004. Each unit was electrofished one time. Reach 1/Units 1, 2 and 5 all had habitat similar to the habitat within Reach 1/Unit 4. Reach 1/Unit 4 had a miss rate of 40.5% (Figure 2); therefore, an additional 40.5% of the captured LCT from each unit was added to Reach 1/Units 1, 2, and 5 to account for potentially missed LCT from each unit. Zero LCT were caught from Reach 2/Unit 4. The habitat within Reach 1/Unit 3 and within the Reach 2 Units was not similar to the habitat within Reach 1/Unit 4; therefore, no additional percentage of LCT was added to Reach 1/Unit 3 and to the Reach 2 Units.

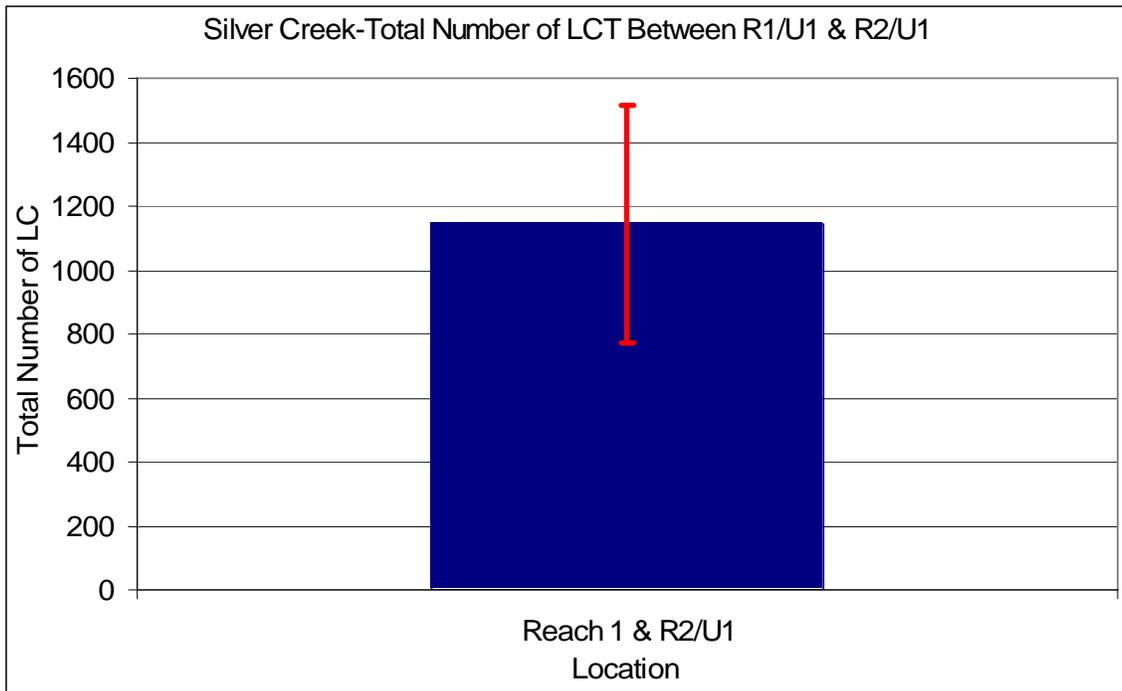


Figure 4: Mean and 90% confidence interval for the estimated total number of LCT within Silver Creek between Reach 1/Unit 1 and Reach 2/Unit 1 on Silver Creek, Bridgeport Ranger District. Surveys were conducted on September 15, 16, 17, and 20 of 2004. The mean number of LCT is 1144, the upper 90% confidence interval is 1515, and the lower 90% confidence interval is 772. This area had the highest density of LCT. The distance between R1/U1 and R2/U1 is approximately 2.25 miles.

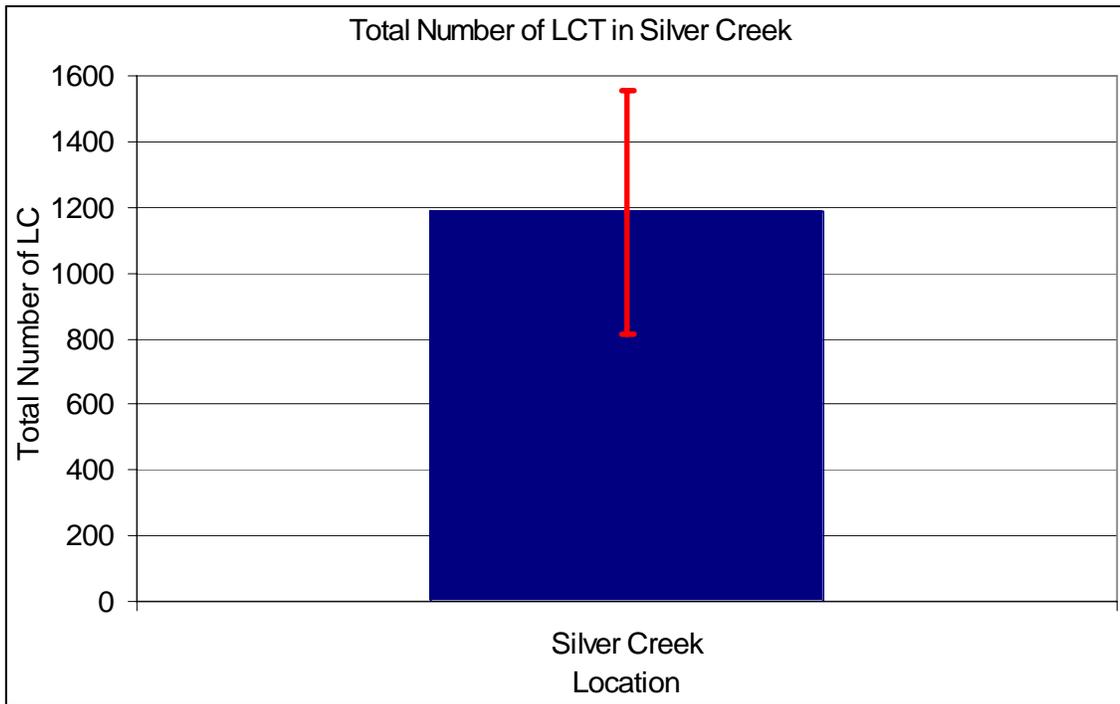


Figure 5: Mean and 90% confidence interval for the estimated total number of LCT within Silver Creek, Bridgeport Ranger District. Surveys were conducted on September 15, 16, 17, and 20 of 2004. The mean number of LCT is 1186, the upper 90% confidence interval is 1558, and the lower 90% confidence interval is 815. Lahontan cutthroat trout in Silver Creek are occupying approximately 3.3 miles of stream habitat

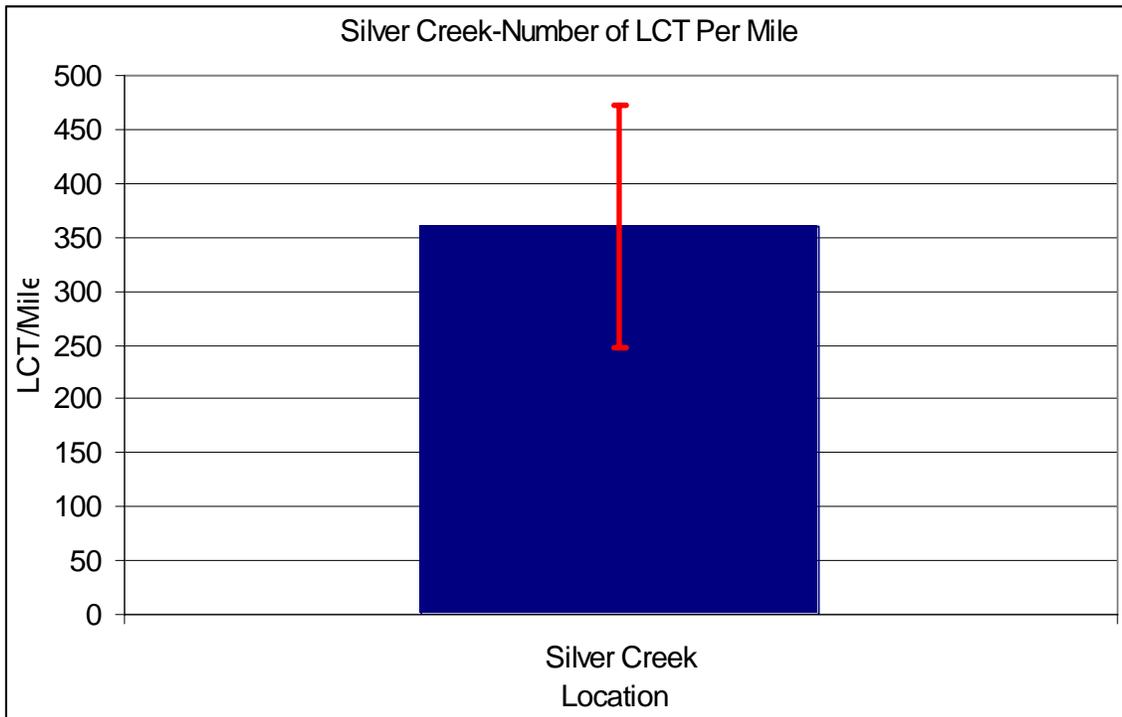


Figure 6: Mean number of LCT/mile and 90% confidence interval for LCT in Silver Creek, Bridgeport Ranger District. Surveys were conducted on September 15, 16, 17, and 20 of 2004. The mean number of LCT/mile is 359, the upper 90% confidence interval is 472, and the lower 90% confidence interval is 247. Lahontan cutthroat trout in Silver Creek are occupying approximately 3.3 miles of stream habitat.

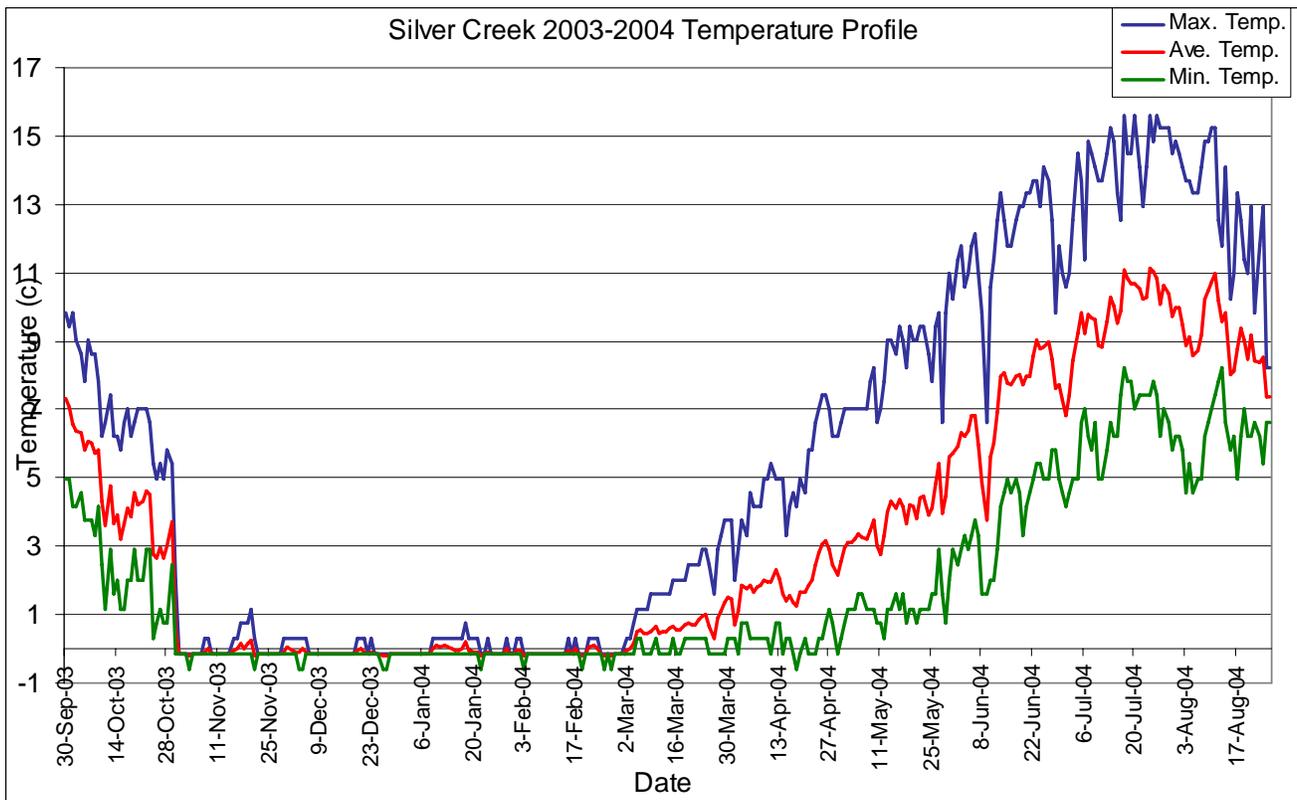


Figure 7: 2003-2004 temperature profile for Silver Creek, Bridgeport Ranger District. Overall maximum temperature was 15.62 degrees Celsius, overall average temperature was 3.27 degrees Celsius, and the overall minimum temperature was -0.61 degrees Celsius. The average temperature between 1 Nov. 2003 and 31 March 2004 was 0.04 degrees Celsius. The average temperature between 30 Sept. 2003 and 31 Oct. 2003, and between 1 April 2004 and 26 Aug. 2004 was 6.36 degrees Celsius. A HOBO Temperature (C) 1996 Onset data logger was used to collect the temperature data. The HOBO Temp was located within Reach 1/Unit 4 at 8717 feet elevation. The HOBO Temp was located at UTM N: 4250368 & E: 275711. Temperature was collected from 30 Sept. 2003 to 26 Aug. 2004.



Figure 8: Silver Creek, Bridgeport Ranger District, fish barrier upstream from the Mountain Warfare Training Center. Picture was taken on 15 Sept. 2004. Barrier is located at UTM N: 4249978.12 & E: 278746.43. This section of the barrier is approximately 20 feet high. This picture is the upper half of the barrier. Lahontan cutthroat trout and Brook Trout are found upstream of this barrier.



Figure 9: Silver Creek, Bridgeport Ranger District, fish barrier upstream from the Mountain Warfare Training Center. Picture was taken on 15 Sept. 2004. Barrier is located at UTM N: 4249978.12 & E: 278746.43. This section of the barrier is approximately 15 feet high. This picture is the lower half of the barrier. Lahontan cutthroat trout and Brook Trout are found upstream of this barrier.



Figure 10: Silver Creek, Bridgeport Ranger District, looking upstream at two culverts below a road-stream crossing. This intersection is located at UTM N: 4250207.44 & E: 278293.77. Picture was taken on 20 Sept. 2004. Culverts are not forming a fish barrier.



Figure 11: Silver Creek, Bridgeport Ranger District, looking downstream at two culverts below a road-stream crossing. This intersection is located at UTM N: 4250207.44 & E: 278293.77. Picture was taken on 20 Sept. 2004. Culverts are not forming a fish barrier.



Figure 12: Silver Creek, Bridgeport Ranger District, looking upstream at a bridge constructed by the Marines in 2003. Bridge does not meet the 100-year flood standards set forth by the Sierra Nevada Forest Plan Amendment. Bridge is located at UTM N: 4250684.21 & E: 276723.72. Picture was taken on 16 Sept. 2004.



Figure 13: Silver Creek, Bridgeport Ranger District, looking downstream at a bridge constructed by the Marines in 2003. Bridge does not meet the 100-year flood standards set forth by the Sierra Nevada Forest Plan Amendment. Bridge is located at UTM N: 4250684.21 & E: 276723.72. Picture was taken on 16 Sept. 2004.



Figure 14: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 1/Unit 1. This Unit is located at UTM N: 4250673.33 & E: 276629.99. Picture was taken on 16 Sept. 2004.



Figure 15: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 1/Unit 1. This Unit is located at UTM N: 4250673.33 & E: 276629.99. Picture was taken on 16 Sept. 2004.



Figure 16: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 1/Unit 2. This Unit is located at UTM N: 4250467.09 & E: 276251.59. Picture was taken on 16 Sept. 2004.



Figure 17: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 1/Unit 2. This Unit is located at UTM N: 4250467.09 & E: 276251.59. Picture was taken on 16 Sept. 2004.



Figure 18: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 1/Unit 3. This Unit is located at UTM N: 4250399.39 & E: 276060.39. Picture was taken on 16 Sept. 2004.



Figure 19: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 1/Unit 3. This Unit is located at UTM N: 4250399.39 & E: 276060.39. Picture was taken on 16 Sept. 2004.



Figure 20: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 1/Unit 4. This Unit is located at UTM N: 4250340.94 & E: 275710.07. Picture was taken on 17 Sept. 2004.



Figure 21: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 1/Unit 4. This Unit is located at UTM N: 4250340.94 & E: 275710.07. Picture was taken on 17 Sept. 2004.



Figure 22: Lahontan cutthroat trout caught from Silver Creek, Bridgeport Ranger District, Reach 1/Unit 4. This Unit is located at UTM N: 4250340.94 & E: 275710.07. Picture was taken on 17 Sept. 2004.



Figure 23: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 1/Unit 5. This Unit is located at UTM N: 4250625.89 & E: 275212.30. Picture was taken on 17 Sept. 2004.



Figure 24: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 1/Unit 5. This Unit is located at UTM N: 4250625.89 & E: 275212.30. Picture was taken on 17 Sept. 2004.



Figure 25: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 2/Unit 1. This Unit is located at UTM N: 4251008.49 & E: 274889.92. Picture was taken on 17 Sept. 2004.



Figure 26: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 1. This Unit is located at UTM N: 4251008.49 & E: 274889.92. Picture was taken on 17 Sept. 2004.



Figure 27: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 2/Unit 2. This Unit is located at UTM N: 4251383.26 & E: 274459.68. Picture was taken on 20 Sept. 2004.



Figure 28: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 2. This Unit is located at UTM N: 4251383.26 & E: 274459.68. Picture was taken on 20 Sept. 2004.



Figure 29: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 2/Unit 3. This Unit is located at UTM N: 4251662.64 & E: 274032.90. Picture was taken on 20 Sept. 2004.



Figure 30: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 3. This Unit is located at UTM N: 4251662.64 & E: 274032.90. Picture was taken on 20 Sept. 2004.



Figure 31: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 2/Unit 4. This Unit is located at UTM N: 4251869.10 & E: 273594.68. Picture was taken on 20 Sept. 2004.



Figure 32: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 4. This Unit is located at UTM N: 4251869.10 & E: 273594.68. Picture was taken on 20 Sept. 2004.



Figure 33: Silver Creek, Bridgeport Ranger District, looking upstream at Reach 2/Unit 5. This Unit is located at UTM N: 4252118.29 & E: 273213.56. Picture was taken on 20 Sept. 2004.



Figure 34: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 5. This Unit is located at UTM N: 4252118.29 & E: 273213.56. Picture was taken on 20 Sept. 2004.



Figure 35: Silver Creek, Bridgeport Ranger District, looking downstream at Reach 2/Unit 5. This Unit is located at UTM N: 4252118.29 & E: 273213.56. Picture was taken on 20 Sept. 2004. Brannon Forester from California Dept. Fish and Game (right) and Stephanie Byers from U.S. Fish and Wildlife Service (left) electrofishing Reach2/Unit5.

HUMBOLDT-TOIYABE NATIONAL FOREST FISH DISTRIBUTION SURVEY DATA FORM

Stream Name: Silver Creek
Reach #: 1
Forest: Humboldt-Toiyabe National Forest
Date: 17 Sept. 04

Watershed: West Walker
Unit #: 4
District: Bridgeport
Surveyors: J. Kling,
 B. Forester, R. Ziegler
GPS Coordinates: N: 4250340.94
 E: 275710.07

Legal Description:
Dominant Overstory: Conifer
Rosgen Channel Type: B
Weather: Sunny **Air Temp:** **Water Temp:**

Dominant Understory:
Time: 09:29

			First Pass Time: 35 Min.		Second Pass Time: 30 Min.		Third Pass Time: 25 Min.	
Unit Length (meters)	Unit Avg Width (1/10m)	Unit Avg Depth (1/10m)	Species (CT, RB, BT, BW)	Total Length (mm)	Species (CT, RB, BT, BW)	Total Length (mm)	Species (CT, RB, BT, BW)	Total Length (mm)
100	3.3	0.25	LCT	260	LCT	212	LCT	250
			LCT	220	LCT	250	LCT	179
			LCT	210	LCT	222		
			LCT	225	LCT	212		
			LCT	215	LCT	180		
			LCT	222	LCT	183		
			LCT	190	LCT	168		
			LCT	200	LCT	205		
			LCT	191	LCT	165 BM		
			LCT	192	LCT	174		
			LCT	223				
			LCT	45				
			LCT	184				
			LCT	220				
			LCT	175				
			LCT	175				
			LCT	195				
			LCT	187				
			LCT	205				
			LCT	46				
			LCT	200				
			LCT	165				

Comments: 6 Brook Trout were netted within this unit. One LCT was missed on the third pass. BM = Burn Mark.

