

**State of California
Department of Fish and Wildlife**

M e m o r a n d u m

Date: 11/18/2019

To: Sarah Mussulman
Sierra Fisheries Supervisor
Department of Fish and Wildlife
North Central Region

From: Mitch Lockhart
Environmental Scientist
Department of Fish and Wildlife
North Central Region

Subject: Visual Encounter Survey and Gill Net set at Cup Lake, El Dorado County

Cup Lake (ID 14398), El Dorado County, is a secluded, off-trail lake located south-west of Upper Echo Lake and Lake Tahoe (Figure 1). The lake is known as a golden trout (*Oncorhynchus mykiss aguabonita*; GT) fishery to backcountry anglers and is one of the few angling opportunities for GT in the greater area. California Department of Fish and Wildlife (CDFW) aerially planted the lake with brook trout (*Salvelinus fontinalis*; BK) from 1951 to 1962. In 1964, the allotment was shifted to GT and stocked regularly until 2008.

However, the species composition of the fishery has differed significantly from its stocking history. CDFW conducted a gill net survey in 2003 and found multiple size classes of BK and evidence of natural reproduction, but no GT. In 2008, CDFW received a tip from an angler that GT, BK, and Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*; LCT) were present in the fishery. A CDFW fisheries biologist conducted a hook-and-

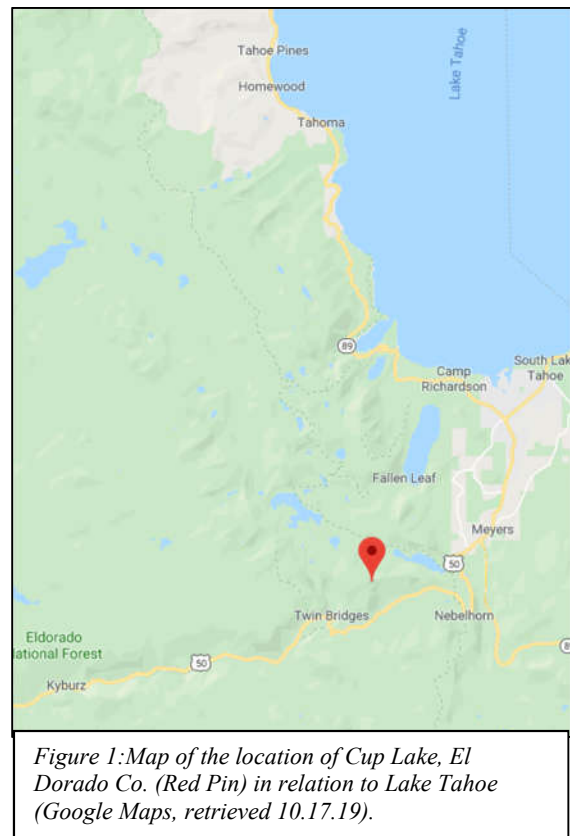
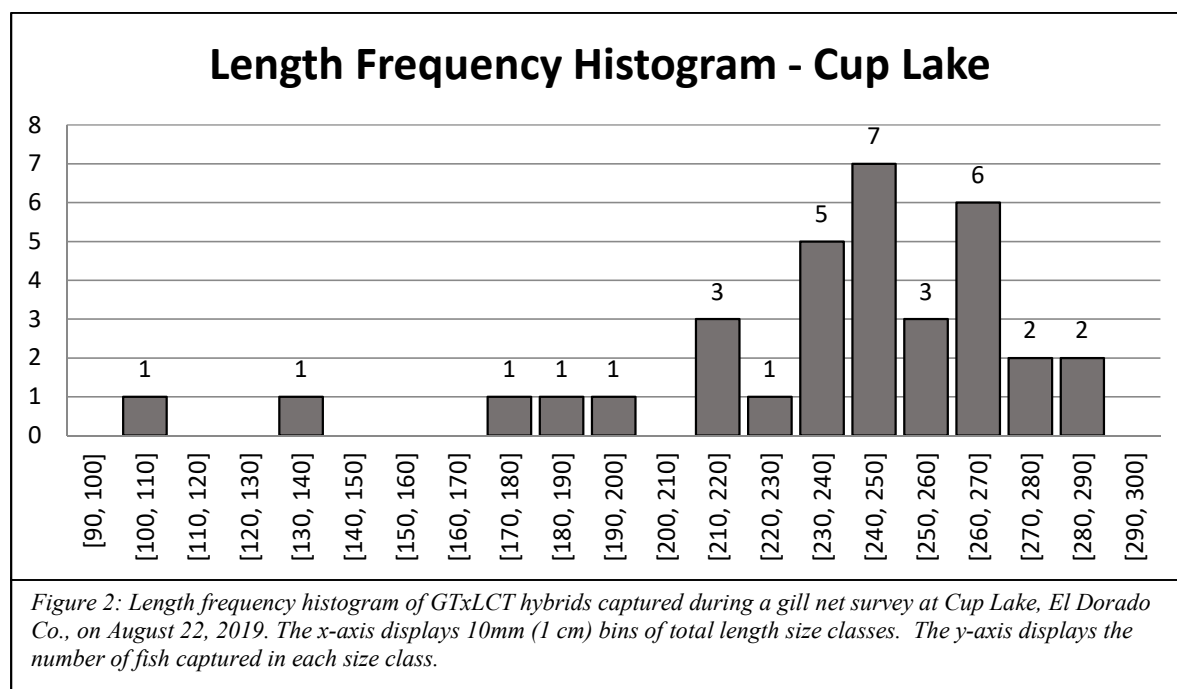


Figure 1: Map of the location of Cup Lake, El Dorado Co. (Red Pin) in relation to Lake Tahoe (Google Maps, retrieved 10.17.19).

line survey in 2008 and caught GT, LCT, and GTxLCT hybrids, confirming the report of LCT, but caught no BK. In 2010, CDFW conducted a second gill net sample to verify the findings and determine if BK were still present. The gill net catch included four GT and 14 LCT, some of which exhibited hybrid characters. No BK were captured. These data show a shift in species composition from a self-sustaining BK fishery to a self-sustaining GT fishery. In the mid- to late-2000's, LCT were introduced to Cup Lake and the fishery is shifting towards self-sustaining LCT and GTxLCT hybrids.

On August 22, 2019, two CDFW Scientific Aides and one volunteer conducted a survey at Cup Lake to determine the current status of the fishery and inform future management activities. A gill net was set at 8:56 am and pulled from the water at 11:19 am for a total survey effort of 2.25 hours. The gill net set was shorter than the usual 8 to 12-hour set called for in the protocol. This was done to increase survivorship of captured fish and lessen the impact of the sample on the secluded population of fish. The gill net survey captured 34 GTxLCT hybrids (Figure 2). Care was taken to remove fish from the gill net quickly, collect measurements and return the fish to Cup Lake alive. Approximately 70% of the catch was released alive.



Afterward, two Scientific Aids conducted a Visual Encounter Survey (VES) to search for special status diurnal herpetofauna, such as the Sierra Nevada yellow-legged frog (*Rana sierra*; SNYLF). The VES began at 12:05 pm under clear skies, moderate wind, and an air temperature of 16° C. The VES concluded at 12:42 pm for a total effort of 45 minutes. No herpetofauna were observed.

Lastly, a hook-and-line survey was conducted from 9:00 am to 2:00 pm. A CDFW volunteer fished the entire time while two CDFW Scientific Aids fished intermittently between other duties, for a total angling effort of 12 hours. A total of 15 fish were landed for a group CPUE of

Table 1: Total catch, angling effort, and CPUE for three anglers during a hook-and-line survey at Cup Lake, El Dorado Co., on Aug. 22, 2019.

Angler	# of Fish	Effort (hr)	CPUE (fish/hr)
Angler 1	14	4	3.5
Angler 2	1	4	0.25
Angler 3	0	4	0
	15		Total CPUE= 3.75

3.75 fish per hour (Table 1). Angler 1 landed 14 of the 15 fish (93%) and had an individual CPUE of 3.5 fish per hour. Angler 2 caught 0.25 fish per hour and Angler 3 landed no fish. All 15 landed fish exhibited a mix of LCT and GT characters (Figure 3). As a result, all fish caught were classified as GTxLCT hybrids.

The 2019 survey at Cup Lake confirmed BK are not present in the fishery indicating Cup Lake fish populations are susceptible to extirpation from stochastic events. Moreover, the 2019 data support the theory that the Cup Lake fishery is shifting towards LCT and away from GT. For example, no trout were captured exhibiting a pure GT phenotype. Given the absence of tributaries to Cup Lake (Figure 4), this may indicate LCT are more successful utilizing in-lake spawning habitat compared to GT.

It is also worth noting that CDFW has no records of an LCT introduction, and it is unclear if the introduction was accidental, or if LCT were introduced intentionally and illegally by a third party. In either case, it is possible that more than one introduction event has occurred, and that the species shift from GT towards LCT is driven by active LCT introduction events over the past 10 years. Given the current status of the fishery and the apparent competitive advantage of LCT, LCT should be considered alongside GT as possible species to plant, if additional plants are warranted.



Figure 3: Examples of GTxLCT hybrid fish captured in the gill net survey (Top), and the hook-and-line survey (Middle & Bottom) at Cup Lake, El Dorado Co., on August 22, 2019.



Figure 4: Overview photo of Cup Lake, El Dorado Co., taken August 22, 2019 and looking approximately south east. Note the shoreline dominated by loose rock, the absence of tributaries, and the lack of an outlet stream. There are no stream channels, rivulets, or swales within the basin. The lake sits within a self-contained watershed without any flowing surface water.

Table 2: Total length, weight, sex, and egg stage of fish captured during a gill net survey at Cup Lake, El Dorado Co., on Aug. 22, 2019.

Species	Length (mm)	Weight (g)	Sex	Egg Stage
GTxLCT	210	110	-	-
GTxLCT	190	92	-	-
GTxLCT	279	150	-	-
GTxLCT	240	190	-	-
GTxLCT	210	85	-	-
GTxLCT	234	120	-	-
GTxLCT	94	206	-	-
GTxLCT	242	110	F	E/L
GTxLCT	240	112	M	-
GTxLCT	180	90	F	R
GTxLCT	210	110	M	-
GTxLCT	270	144	M	-
GTxLCT	125	135	F	E/L
GTxLCT	273	150	M	-
GTxLCT	255	150	M	-
GTxLCT	235	160	F	E/L
GTxLCT	240	110	F	R
GTxLCT	260	140	F	R
GTxLCT	219	95	F	E/L
GTxLCT	240	110	F	E/L
GTxLCT	225	90	F	E/L
GTxLCT	223	98	M	-
GTxLCT	254	110	-	-
GTxLCT	230	120	-	-
GTxLCT	230	130	M	-
GTxLCT	230	110	M	-
GTxLCT	235	100	-	-
GTxLCT	170	85	-	-
GTxLCT	255	152	M	-
GTxLCT	255	100	M	-
GTxLCT	260	160	M	-
GTxLCT	270	142	M	-
GTxLCT	250	170	M	-
GTxLCT	245	105	M	-

Table 3: Species, total length, gear type, and angler # of fish captured during a hook-and-line survey at Cup Lake, El Dorado Co., on Aug. 22, 2019

Species	Length (mm)	Gear Type	Angler #
GTxLCT	247	Lure	Angler 1
GTxLCT	241	Lure	Angler 1
GTxLCT	247	Lure	Angler 1
GTxLCT	247	Lure	Angler 1
GTxLCT	266	Lure	Angler 1
GTxLCT	273	Lure	Angler 1
GTxLCT	247	Lure	Angler 1
GTxLCT	215	Lure	Angler 1
GTxLCT	190	Lure	Angler 1
GTxLCT	210	Lure	Angler 1
GTxLCT	212	Lure	Angler 1
GTxLCT	220	Lure	Angler 1
GTxLCT	210	Lure	Angler 1
GTxLCT	225	Lure	Angler 1
GTxLCT	228	Lure	Angler 2

Re-scanned 9/6/19 LM
Entered 8.30.19 PF

LENGTH-WEIGHT DATA SHEET

Date 8/22/19 Water Cup Lake

Sampler L. Mitchell, C. Hettrick Area Desolation wilderness - Ralston peak

Sampling Method Gill Net Set: 0856 Pulled: 1119 Other Location (UTM): 10s E: 6752244 N: 4301569

Species	LCT		SEX	Egg	LCT x GT		Sex	Egg	Length TL (mm)	Weight (gm)
	Length TL (mm)	Weight (gm)			Length TL (mm)	Weight (gm)				
1	210	110	-	-	254	110	-	-		
2	190	92	-	-	230	120	-	-		
3	274	156	-	-	230	130	M	-		
4	240	196	-	-	230	110	M	-		
5	210	85	-	-	235	100	-	-		
6	234	120	-	-	170	85	-	-		
7	94	206	-	-	255	152	M	-		
8	242	110	F	E/L	255	100	M	-		
9	240	112	M	-	260	160	M	-		
10	180	90	F	R	270	142	M	-		
11	210	110	M	-	250	170	M	-		
12	270	144	M	-	245	105	M	-		
13	125	135	F	E/L						
14	273	150	M	-						
15	255	150	M	-						
16	235	160	F	E/L						
17	240	110	F	R						
18	260	140	F	R						
19	214	95	F	E/L						
20	240	110	F	E/L						
21	225	90	F	E/L						
22	223	98	M	-						
23	260									
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Figure 5: Data sheet with gill net data from a survey conducted Aug. 22, 2019, at Cup Lake, El Dorado County.

CDFW High Mountain Lakes - Amphibian and Reptile Visual Encounter Survey Data Sheet

Site ID: 14398		Date: 8/22/19		SKY: <input checked="" type="radio"/> Clear <input type="radio"/> Partly Cloudy <input type="radio"/> Mostly Cloudy <input type="radio"/> Overcast <input type="radio"/> Rain <input type="radio"/> Snow <input type="radio"/> Smoke		WIND: <input type="radio"/> Calm <input type="radio"/> Light <input checked="" type="radio"/> Moderate <input type="radio"/> Strong	
Topo Name: (1:24,000)		County: El Dorado		Elevation: m ft		If not surveyed, provide reason: <input type="radio"/> Private Property <input type="radio"/> Frozen <input type="radio"/> Not Found <input type="radio"/> No Access	
Surveyors: L. Mitchell, C. Hettrick				Water Type: <input checked="" type="radio"/> Lake <input type="radio"/> Unmapped pond <input type="radio"/> Marsh/meadow <input type="radio"/> Spring seep		Stream (Skip to "STREAMS" on pg. 2)	
Lake Name: (from map) Cup Lake		East UTM:		North UTM:		UTM Zone:	
Color: <input checked="" type="radio"/> Clear <input type="radio"/> Stained		Water (5 m from shore, Temp 10cm deep): 18 @ 12:40 C or F		Air (1 m above water): 16 @ 12:02 C or F		Seasonality: <input type="radio"/> Perennial <input type="radio"/> Ephemeral	
Turbidity: <input checked="" type="radio"/> Clear <input type="radio"/> Cloudy		Survey START time: 1205		Survey END time: 1242		Total survey duration (min): 45	
HERPS SEEN? <input checked="" type="radio"/> YES <input type="radio"/> NO		FISH SEEN? <input checked="" type="radio"/> YES <input type="radio"/> NO		Currently Dry? <input type="radio"/> Yes <input checked="" type="radio"/> No			

***FOR LAKES/PONDS/MEADOWS: ALSO SURVEY FIRST 200 m OF INLETS AND OUTLETS. RECORD DATA SEPARATELY IN THE "STREAMS" SECTION ON PG. 2**

HERP SPECIES	# adults	# subadults	# metamorphs	# larvae	# egg m.	# swabs	Survey Method
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental
Calling? Y N							Visual Trapped Aural Hand Collected Amp Net Incidental

FISH SPECIES (circle species seen, if known): BK (brook trout), BN (brown trout), CT (cutthroat trout), GT (golden trout), RT (rainbow trout), HYBRID (e.g., GT x RT), OTHER (e.g., minnows)

Amphibians: S. Long-toed Salamander (AMMA); Yosemite Toad (ANCA, fmlly BUCA); Sierran Treefrog (HYSI, fmlly PSRE or HYRE); Sierra Nevada Yellow-legged Frog (RASI)

Amph. less common in HML: CA Toad (ANBO, fmlly BUBO); Bullfrog (RACT); Cascades Frog (RACA); CA Red-legged Frog (RADR); Sierra Newt (TASI, fmlly TATO)

Reptiles: Sierra Gartersnake (THCO); Mountain Gartersnake (THEL); Valley Gartersnake (THSI); Western Pond Turtle (EMMA, fmlly CLMA)

PHOTOS	Photo Number	Camera	Time	Date (yyyymmdd)	UTM E	UTM N	Comments
Overview	0926	LVC	0926	2019-08-22	0752058	4361588	
Herps							
Other							

SITE SKETCH: 	NOTES: LCT, LCT x GT present in Gill net and hook and line efforts.
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Figure 6: VES data sheet from a survey conducted Aug. 22, 2019, at Cup Lake, El Dorado County.

STREAM																	
Inlet Outlet (circle one) #		Stream Type: Perennial Ephemeral		Stream Currently Dry? Y N		Intermittent? Y N											
Start		End		Color: Clear Stained NA		Turbidity: Clear Cloudy NA											
UTM E: UTM N:		UTM E: UTM N:		Water Temp:		Air Temp:		*BARRIERS (fill out info below)*									
Start Time: End Time: Duration (min):																	
Fish present? Y N		Barrier 1) Photo #'s:		UTM E: UTM N:		Description:											
Herps present? Y N		Barrier 2) Photo #'s:		UTM E: UTM N:		Description:											
Spawning evidence? Y N		Barrier 3) Photo #'s:		UTM E: UTM N:		Description:											
Spawning / Redds / Fry / None																	
Inlet Outlet (circle one) #		Stream Type: Perennial Ephemeral		Stream Currently Dry? Y N		Intermittent? Y N											
Start		End		Color: Clear Stained NA		Turbidity: Clear Cloudy NA											
UTM E: UTM N:		UTM E: UTM N:		Water Temp:		Air Temp:		*BARRIERS (fill out info below)*									
Start Time: End Time: Duration (min):																	
Fish present? Y N		Barrier 1) Photo #'s:		UTM E: UTM N:		Description:											
Herps present? Y N		Barrier 2) Photo #'s:		UTM E: UTM N:		Description:											
Spawning evidence? Y N		Barrier 3) Photo #'s:		UTM E: UTM N:		Description:											
Spawning / Redds / Fry / None																	
Inlet Outlet (circle one) #		Stream Type: Perennial Ephemeral		Stream Currently Dry? Y N		Intermittent? Y N											
Start		End		Color: Clear Stained NA		Turbidity: Clear Cloudy NA											
UTM E: UTM N:		UTM E: UTM N:		Water Temp:		Air Temp:		*BARRIERS (fill out info below)*									
Start Time: End Time: Duration (min):																	
Fish present? Y N		Barrier 1) Photo #'s:		UTM E: UTM N:		Description:											
Herps present? Y N		Barrier 2) Photo #'s:		UTM E: UTM N:		Description:											
Spawning evidence? Y N		Barrier 3) Photo #'s:		UTM E: UTM N:		Description:											
Spawning / Redds / Fry / None																	
Inlet Outlet (circle one) #		Stream Type: Perennial Ephemeral		Stream Currently Dry? Y N		Intermittent? Y N											
Start		End		Color: Clear Stained NA		Turbidity: Clear Cloudy NA											
UTM E: UTM N:		UTM E: UTM N:		Water Temp:		Air Temp:		*BARRIERS (fill out info below)*									
Start Time: End Time: Duration (min):																	
Fish present? Y N		Barrier 1) Photo #'s:		UTM E: UTM N:		Description:											
Herps present? Y N		Barrier 2) Photo #'s:		UTM E: UTM N:		Description:											
Spawning evidence? Y N		Barrier 3) Photo #'s:		UTM E: UTM N:		Description:											
Spawning / Redds / Fry / None																	
Inlet Outlet (circle one) #		Stream Type: Perennial Ephemeral		Stream Currently Dry? Y N		Intermittent? Y N											
Start		End		Color: Clear Stained NA		Turbidity: Clear Cloudy NA											
UTM E: UTM N:		UTM E: UTM N:		Water Temp:		Air Temp:		*BARRIERS (fill out info below)*									
Start Time: End Time: Duration (min):																	
Fish present? Y N		Barrier 1) Photo #'s:		UTM E: UTM N:		Description:											
Herps present? Y N		Barrier 2) Photo #'s:		UTM E: UTM N:		Description:											
Spawning evidence? Y N		Barrier 3) Photo #'s:		UTM E: UTM N:		Description:											
Spawning / Redds / Fry / None																	
HERP SPECIES		In/Outlet #		# adults		# subadults		# metamorphs		# larvae		# egg m.		# swabs		Survey Method	
		(circle one) #														Visual Trapped	
Calling? Y N		IN														Aural Hand Collected	
		OUT														Amp Net Incidental	
		(circle one) #														Visual Trapped	
Calling? Y N		IN														Aural Hand Collected	
		OUT														Amp Net Incidental	
		(circle one) #														Visual Trapped	
Calling? Y N		IN														Aural Hand Collected	
		OUT														Amp Net Incidental	
		(circle one) #														Visual Trapped	
Calling? Y N		IN														Aural Hand Collected	
		OUT														Amp Net Incidental	
<p>FISH SPECIES (circle species seen, if known): BK (brook trout), BN (brown trout), CT (cutthroat trout), GT (golden trout), RT (rainbow trout), HYBRID (e.g., GT x RT), OTHER (e.g., minnows)</p> <p>Amphibians: S. Long-toed Salamander (AMMA); Yosemite Toad (ANCA, family BUCA); Sierran Treefrog (HYSI, family PSRE or HYRE); Sierra Nevada Yellow-legged Frog (RASI)</p> <p>Amph. less common in HML: CA Toad (ANBO, family BUBO); Bullfrog (RACT); Cascades Frog (RACA); CA Red-legged Frog (RADR); Sierra Newt (TASI, family TATO)</p> <p>Reptiles: Sierra Gartersnake (THCO); Mountain Gartersnake (THEL); Valley Gartersnake (THSI); Western Pond Turtle (EMMA, family CLMA)</p> <p>PLEASE Return to: Isaac Chellman, California Department of Fish and Wildlife, (916) 358-4038; 1701 Nimbus Rd., Rancho Cordova, CA 95670</p>																	
<p>Field review _____ Copied _____ Entered _____ Proofed _____</p> <p>Herp Data Sheet, pg. 2 of 2</p>																	

Figure 6, Con't: VES data sheet from a survey conducted Aug. 22, 2019, at Cup Lake, El Dorado County.