



**NATIVE FISH CONSERVATION IN THE CLEAR CREEK DRAINAGE: 2021
ACTIVITIES**

Michael J. Hadley
Aquatic Biologist

Jens H. Swensen
Fishlake National Forest Fisheries Biologist

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Introduction

Native Bonneville cutthroat trout (BCT) were restored throughout the Clear Creek drainage from 2011 to 2014 in a cooperative project by Utah Division of Wildlife Resources (DWR) and the Fishlake National Forest (FNF) (Hadley et al. 2011a-b, Hadley et al. 2012a-c, Hadley et al. 2013a-b, Hadley and Whelan 2014, Hadley, et al. 2018). Prior to the project, most of the drainage was populated by nonnative rainbow (RBT) and brown trout. Following the BCT restoration, four other native fish species – southern leatherside chub, mountain sucker, mottled sculpin, and speckled dace – were also restored to appropriate habitat. All five native fish species were observed to establish and expand during the following years. At the time of the completion of the project, the Clear Creek drainage represented the largest stream drainage in Utah (65 miles) supporting only native fish species. The drainage also became a focal point for native cutthroat trout restoration, conservation, and sport fishing interest in southern Utah.

Beginning around 2019, anglers began submitting reports of catches of fish that appeared to be RBT or RBT-BCT hybrids in the lower reaches of Fish Creek. During the next two years, several more reports of hybridized fish were received from both Fish Creek and the reach of Clear Creek immediately downstream. Upon receiving these reports, DWR and FNF staff investigated the presence of hybrid fish via electrofishing in Clear, Fish, and Shingle creeks and confirmed their presence. Although it was unknown how these fish reinvaded the drainage, it became clear that a significant number of RBT or hybrids were present and posed a threat to the BCT conservation population. DWR and FNF staff committed in 2021 to document the extent of hybrid establishment in the drainage and address the problem.

Hybrid Distribution Surveys

FNF surveyed the reach of Fish Creek upstream (south) of Forest Road (FR) 1038 (Mud Flat Road) in late July and early August 2021 to find the upper extent and relative abundance of hybrids (Appendix). In the approximate 2 miles upstream of the road crossing, they caught and removed 32 suspected hybrids. Later analysis of photos determined that several of these fish may have been BCT. Another visit by DWR found three more hybrids near the upper extent previously noted, nearly 6 miles upstream of the Fish Creek-Clear Creek confluence.

DWR staff also surveyed the reach of Clear Creek between the confluences of Fish and Shingle creeks in August 2021. While several hybridized trout were observed in the lowest 0.7-mile reach between Fish Creek and a semi-functional fish passage barrier built during the restoration project, only BCT were observed in the rest of the Clear Creek reach upstream to Shingle Creek. FNF surveys in this section of Clear Creek in June of 2020 discovered three hybrid trout above the barrier. However, the abundance of the four native non-salmonid fish species, as well as no further hybrids detected in 2021, prompted project staff to omit this section from treatment.

The results of these surveys exhibited the need to remove hybridized trout before they could spread farther through the drainage. A rotenone treatment was scheduled for late September 2021, to target the stream reaches from the upper hybrid extents observed in 2021, downstream to the “middle” Clear Creek barrier located just upstream of the Narrows.

Native Fish Salvage

During the distribution surveys, mountain suckers were observed in Fish Creek upstream of the upper extent of RBT-BCT hybrids, while mottled sculpin and speckled dace were

abundant only near the FR 1038 crossing. Leathersides were not observed in Fish Creek. All four of these species were introduced at the road crossing after the original rotenone treatments. Mountain suckers migrated much farther upstream in the intervening years, while leathersides apparently failed to establish. Prior to the September rotenone treatment, UDWR crews collected suckers, sculpin, and dace from the Fish Creek reach near the FR 1038 crossing and packed them by horse upstream of the treatment target reach. Because mountain suckers were observed upstream of the treatment reach, the transfer focused on moving more mottled sculpin and speckled dace. In addition, all four native non-salmonid species (including leathersides) were collected from upper Clear Creek after the 2021 treatment and transferred to Fish Creek at the road crossing.

Rotenone Treatment

Table 1 lists personnel that participated in the treatments in the Clear Creek drainage in 2021, with assigned tasks. Liquid rotenone was applied to Fish Creek and Clear Creek on September 20-21, 2021, using three 35-gal (7-hr charge) drip barrels and one 7-gal (4-hr charge) drip barrel. Rotenone (5% active ingredient) was applied at a concentration of 1.5 parts per million (ppm). The 35-gal barrels were set upstream of the observed hybrid distribution in Fish and Clear creeks, as well as at the FR 1038 crossing in Fish Creek to act as a booster to rotenone concentration (Fig. 1-3). These drips started applying rotenone between 11:00 pm on September 20 and 12:00 am on September 21 to facilitate overnight application and achieve coverage of the target area by morning. Drip 1 in Fish Creek was set for a second charge on the morning of September 21. Dead fish observed at the booster and Fish Creek-Clear Creek confluence between 5:00 and 6:00 am indicated rotenone arrival and negated the need for a second charge in Booster 1 or 2. Drip 1 was pulled by 10:30 am. The 7-gal barrel was set at the barrier in Pole Creek at 6:30 am and run for nearly five hours. Rotenone travel time was monitored by behavior of stream resident fish at key locations (Table 2). Spray crews were assigned to inspect the entire treatment area for potential refugia and areas of low mixing and applied rotenone to these sites with backpack sprayers. A total of 7.3 gal (27.6 L) of rotenone was applied to Fish and Clear creeks on September 20 and 21 (Table 3) – 7.0 gal by drip barrels and 0.3 gal by sprayers. A total of 8.1 miles (13.0 km) of stream were treated with rotenone (Table 4). Frozen sprayer nozzles encountered after a cold night presented the only complication encountered during rotenone application. Drip heads were unaffected by cold temperatures.

Spray crews counted RBT and hybrids they observed while walking each stream reach. These fish were most abundant in lower Fish Creek, where 225 to 250 were observed between FR 1038 and the Clear Creek confluence. (50 to 75 were observed in a large beaver pond nearly one mile downstream of I-70.) Spray crews observed only 12 hybrids or RBT upstream of FR 1038 and just six in Clear Creek below the Fish Creek confluence. Most fish appeared to be hybrids, rather than pure RBT. BCT and mountain suckers were abundant throughout the target area, while the other native species were abundant in some reaches.

Potassium permanganate (KMnO_4) was applied to toxic waters at a constant rate using an auger-hopper system to deactivate the rotenone below the target area. The detox station was set in Clear Creek between the “middle” barrier and the top of the Narrows (Fig. 3). A back up station was set up in the Narrows. Sentinel fish were placed both upstream (to monitor rotenone arrival) and downstream (to monitor deactivation) of the detox station. Application of KMnO_4 began at 2:00 am on September 21. Rotenone reached detox from Drip 2 at 5:20 am (Table 2).

The oxidizer was applied at a mean rate of 66 g/min for 30 hours until 8:00 am on September 22. Monitoring of sentinel fish below the detox station indicated that the rotenone was successfully deactivated below the target area. Operation of the backup detox station was not necessary. 200 lbs (91 kg) of KMnO_4 were applied at the detox station (Table 3).

Discussion

Observations of dead fish during the September 2021 rotenone treatment showed that the highest density of hybrid RBT-BCT was centered in lower Fish Creek, with lessening abundance in reaches upstream and downstream. Hybrids were more readily spreading upstream in Fish Creek than downstream into the middle reaches of Clear Creek. An existing, semi-functional fish passage barrier may have partially prevented further invasion into upper Clear Creek. Three hybrid trout were discovered above this barrier in Clear Creek in 2020 electrofishing surveys. The extended, high spring runoff in 2019 likely allowed these fish to bypass the barrier. Electrofishing and rotenone spray crews reported no hybrid trout in upper Clear Creek or lower Shingle Creek in August and September 2021, demonstrating that the barrier prevented fish passage during most flow conditions.

Although it is impossible to know exactly how nonnative trout appeared in the drainage, the location of the invasion in the center of the drainage rules out passage over barriers from the Sevier River. Illegal introduction by the public would more likely target reintroduction of RBT to more accessible areas within the drainage than lower Fish Creek. The most plausible explanation for how hybrid trout reappeared in the Clear Creek drainage was that a small number of RBT persisted in lower Fish Creek during rotenone treatments in 2013 and 2014. Due to poor access in this reach, the resulting hybrid fish went unobserved for several years until they began to expand more rapidly to areas of higher angler traffic.

Treatment personnel concluded that the 2021 rotenone treatment was successful in removing all or most RBT and RBT-BCT hybrids from lower Fish Creek and middle Clear Creek. Abundant extra fingerling BCT were available from the Manning Meadow brood operation, so 32,000 2.5-inch fish were stocked in Fish Creek at the FR 1038 crossing on September 28, 2021. As was previously mentioned, mountain suckers, mottled sculpin, speckled dace, and southern leathersides were transferred from Clear Creek to Fish Creek on October 28.

UDWR and FNF staff have committed to further investigation of RBT or hybrid invasion in the Clear Creek drainage. Although much less common, scattered reports of such fish being caught in the Fremont Indian State Park reach have been received. In fact, FNF staff caught and removed two suspected hybrids from lower Clear Creek in mid-November (Fig. 4). Because further rotenone treatments in the drainage are highly undesirable, electrofishing surveys will be instrumental in determining if mechanical removal efforts can prevent RBT or hybrids from negatively impacting the survival or genetic integrity of southern Utah's largest BCT population.

Literature Cited

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Figure 1. Locations of rotenone drip stations set in Fish Creek, from the upper extent of RBT-BCT hybrids to FR 1038.

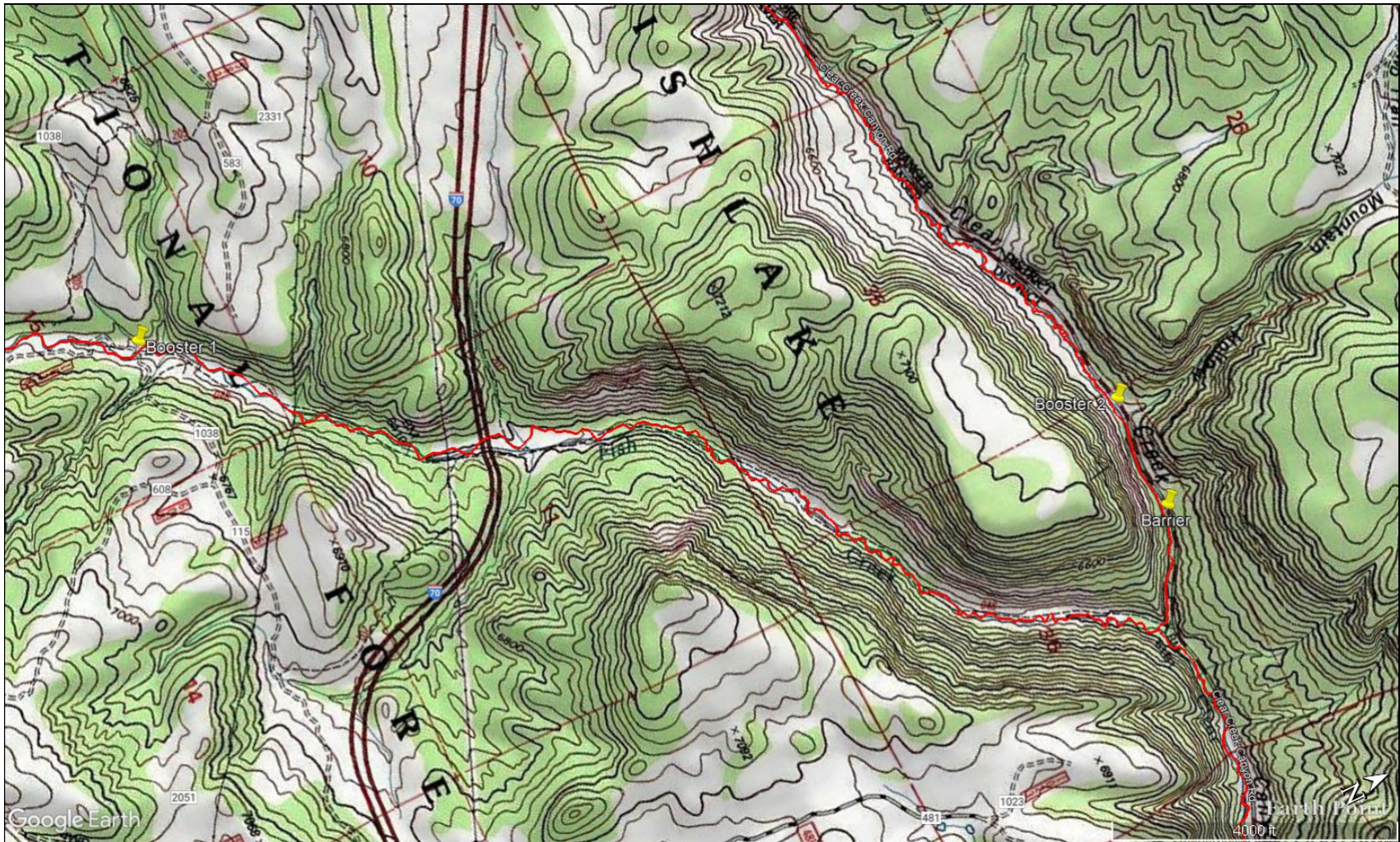


Figure 2. Locations of rotenone drip stations set in Fish Creek, from FR 1038 to Clear Creek.

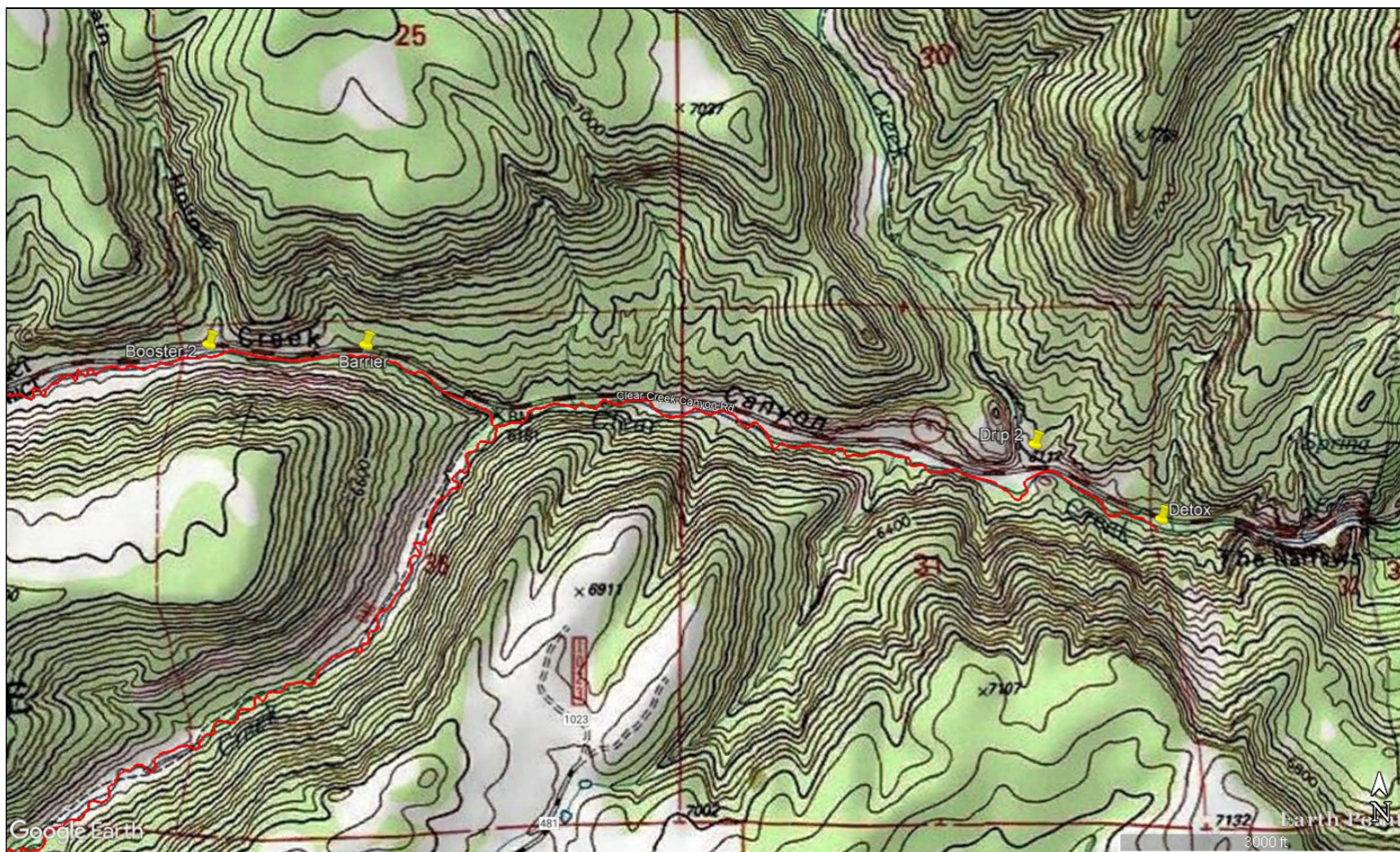


Figure 3. Locations of rotenone drip stations and detox in Clear Creek and Pole Creek.



Figure 4. Suspected RBT-BCT hybrid caught in and removed from lower Clear Creek in November 2021.

Table 1. Project personnel and assignments for chemical treatments in Fish Creek and Clear Creek in 2021.

Personnel	Assignment
Mike Hadley, UDWR SRO	Planning, recon, supervise, salvage
Jens Swensen, FNF	Planning, recon, supervise, drips
MaKayla Roundy, UDWR SRO	Recon, drips, spray, salvage
Abby Silva, UDWR SRO	Recon, drips, spray, salvage
Nic Braithwaite, UDWR SRO	Drips, spray
Meghan Krott, BLM	Spray
Danelle Ellington, FNF	Recon, spray
Matt McKell, UDWR NRO	Spray
Mike Jensen, UDWR SRO	Logistics, pack animals, salvage
Jim Whelan, FNF	Detox
Chuck Chamberlain, USFS	Detox
Logan Ekker, FNF	Recon

Table 2. Rotenone travel time and rate in selected treated reaches.

Stream	Reach	Distance (mi)	Travel Time (hrs)	Rate (mi/hr)
Fish Creek	Drip 1 to Booster 1	2.24	5.0 ¹	0.45
Fish Creek	Booster 1 to Clear Creek	3.52	7.0 ¹	0.50
Clear Creek	Booster 2 to Detox	2.32	5.6	0.42

¹ – Minimum travel time – rotenone may have arrived to reach end point much earlier.

Table 3. Chemical used during 2021 treatments in the Clear Creek drainage.

Date and location	Chemical and formulation	Application method	Amount of chemical used	Concentration / rate
Sep 20-21, 2021 Fish Creek	Liquid rotenone, 5% active ingredient	Drip barrels and back pack sprayers	4.9 gal (18.4 L)	~1.5 ppm total ingredient
Sep 20-21, 2021 Clear Creek	Liquid rotenone, 5% active ingredient	Drip barrels and back pack sprayers	2.4 gal (9.2 L)	~1.5 ppm total ingredient
Sep 21-22, 2021 Clear Creek	Potassium permanganate	Auger	200 lbs (91 kg)	66 g/min (mean)

Table 4. Length of stream treated with rotenone in the Clear Creek drainage in 2021.

Stream	Length (mi)	Length (km)
Fish Creek	5.76	9.27
Clear Creek	2.32	3.73
Total	8.08	13.00

Appendix

Results of electrofishing single-pass surveys conducted by Fishlake National Forest in late July and early August, 2021.

Hybrid Investigation – Fish Creek

Day One – 07/29/2021

Start UTM – 374026, 4267849

Number of Hybrids Found	UTM	Photo Number
4	374013, 4267828	1
1	374023, 4267725	2
2*	373936, 4267658	3
1*	373796, 4267378	4
1	373806, 4267330	5
1	373774, 4267116	6
1*	373763, 4266987	7
1	373712, 4266841	8
2	373707, 4266732	9
1*	373678, 4266620	10

End UTM – 373648, 4266473

*These are fish Logan and DaNelle thought might be hybrids but were not 100% sure. Therefore, they took photos and UTM's for confirmation.

Day Two - 08/05/2021

Start UTM – 373648, 4266473

Number of Hybrids Found	UTM	Photo Number
1*	373637, 4266451	11
1	373628, 4266431	
1	373546, 4266363	
1	373440, 4266227	
1*	373427, 4266181	12
1*	373399, 4266089	13
1	373384, 4266051	
2	373385, 4266019	
2*	373397, 4265967	14
2	373354, 4265632	
1	373399, 4265581	

1*	373361, 4265540	15
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End UTM – 373310, 4265312

Pictures taken on this day were just of hybrids that the technicians were not sure about.

*These are fish Logan and DaNelle thought might be hybrids but were not 100% sure. Therefore, they took photos and UTMs for confirmation.

Hybrid Photos



Photo 1. Very pixilated spots. White coloration on the tips of the anal, pelvic, and dorsal fins. Rainbow trout coloration (silver/green).



Photo 2. Red/pink stripe and some white coloration on the tips of the dorsal, anal, and pelvic fins. Spots on the lower part of the body beginning to look more pixilated. More rainbow trout coloration on body (greens, silvers, etc.).



Photo 3. Red/pink stripe and some white coloration on the tips of the dorsal and anal fins.



Photo 4. Only hybrid characteristic was the very prominent white tip on the pectoral fin with the white coloration outlining the whole bottom of fin. [UDWR comment: Likely BCT – white fin tips alone is not a determining characteristic for hybrids in the first few generations.]



Photo 5. Red/pink stripe and very white coloration on the tips of the anal, pelvic, and dorsal fins.



Photo 6. Rainbow Trout coloration (greens, silvers, etc.), white coloration on tips of anal, pelvic, and dorsal fins, and very pixilated spots from the head to the adipose fin.



Photo 7. Pink/red stripe somewhat apparent and white coloration on tips of anal, pelvic, and dorsal fins. As well as some rainbow trout coloration (shimmering green/silver on upper body).



Photo 8. Prominent red/pink stripe as well as very defined white tips on the anal, pelvic, and dorsal fins. With the white lining the outer fin on the anal and pelvic fins.



Photo 9. Rainbow trout coloration (silver/green). Very pixilated spots and some white coloration on the anal, pelvic, and dorsal fins.



Photo 10. White coloration on the tips of the anal and pelvic fins. More rainbow trout coloration rather than Bonneville coloration. However, the technicians were not sure if that was due to the age of the fish or if it was a hybrid. [UDWR comment: likely BCT.]



Photo 11. White coloration on the tips of the anal and dorsal fins. Some rainbow trout coloration on the dorsal portion of the body (green/shimmery). [UDWR comment: likely BCT.]



Photo 12. White coloration on the tips of the anal and pelvic fins. Pink/red stripe.



Photo 13. Very apparent white coloration on tips of anal and pelvic fins. Pink/red stripe.



Photo 14. Pink/red stripe. White coloration on tips of anal, pelvic, and dorsal fins.



Photo 15. Only hybrid characteristic on this fish was the very apparent white coloration on the anal, pelvic and dorsal fins. [UDWR comment: likely BCT.]