2019 SURVEY OF BONNEVILLE CUTTHROAT TROUT IN THE LOWER SEVIER RIVER DRAINAGE, UTAH

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Publication Number 20-05

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February 2020

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INTRODUCTION

The Bonneville cutthroat trout (*Oncorhynchus clarkii utah*) (BCT) is one of only four recognized subspecies of trout native to Utah. Similar other subspecies of cutthroat trout throughout the Intermountain West, habitat alterations and introductions of nonnative trout from the late 1880s until the 1970s caused large-scale losses of this native fish. Active management of BCT began in southern Utah after the Endangered Species Act was passed in 1973 (Hepworth et al. 2002). By the 1990s, interagency commitment to conserving, protecting, and expanding populations of BCT led to the development of a formal management strategy for the state of Utah (Lentsch et al. 1997), which was followed by a strategy and agreement for range wide conservation (Lentsch et al. 2000). The strategy was most recently updated in 2018 (BCT Conservation Team 2018). BCT conservation was also identified as a primary objective by the Utah Division of Wildlife Resources (UDWR) in a management plan for the lower Sevier River drainage (Hydrologic Unit Code [HUC] 16030005) (Hepworth et al. 2007). BCT conservation efforts in the Southern Bonneville Geographic Management Unit (GMU) – which encompasses the southern portion of the Bonneville Basin – are coordinated and completed by a cooperative interagency team, with representatives from UDWR, Fishlake National Forest (FNF), Dixie National Forest (DNF), Bureau of Land Management (BLM), and Trout Unlimited (TU). This team acts as a subset of the range wide BCT Conservation Team.

A principal component of native cutthroat trout management is the monitoring of populations to assess their current status and give direction to management actions. Range-wide status reviews of BCT were completed in 2001 (U.S. Fish and Wildlife Service [USFWS] 2001) and 2005 (May and Albeke 2005). This report presents results of surveys of BCT populations conducted in the lower Sevier River drainage in 2019, as well as discussion of limiting factors and future conservation efforts. Comparison with historic data was only possible for Oak Creek; other streams were not previously surveyed because populations were in the process of establishment.

STUDY AREA AND HISTORY

The Sevier River is found within the eastern Great Basin, draining a large portion of central and southern Utah. Much of the main stem of the Sevier River was once inundated by prehistoric Lake Bonneville, with the mountainous tributaries feeding the lake. After the desiccation of the lake some 10,000 years ago, cutthroat trout persisted in suitable cold water

habitats. The lower Sevier River drainage is located in south central Utah (Figure 1) and is bounded by Yuba (Sevier Bridge) Reservoir at its upstream limit and the terminus of the Sevier River at Sevier Lake at its downstream limit. The perennial tributaries of the lower Sevier River drain the north and west slopes of the Pahvant Plateau and the west slopes of the Canyon and San Pitch Mountains. Trout-bearing reaches of these streams are found within the FNF and Manti-La Sal National Forest. Streams are relatively short and do not connect to the Sevier River due to a combination of natural topography and diversion for agricultural irrigation.

There are no known remnant BCT populations in the lower Sevier River drainage. Anecdotal reports of trout with cutthroat appearance in the headwaters of Chalk Creek and Meadow Creek have been communicated to GMU staff, though the likelihood of hybridization with non native rainbow trout in these streams is very high. Attempts have been made to restore BCT in three streams in the drainage – Oak Creek, Deep Creek, and North Fork Corn Creek (Fig. 1).

BCT were first stocked in Oak Creek (Fig. 2) in the Canyon Mountains in 2005, following flash floods in the previous years that had severely impacted the stream's wild population of brown trout. The original addition of BCT to Oak Creek was intended to enhance sport fishing opportunities with native fish, rather than to completely replace non native trout with a conservation population. This and all subsequent stocking events introduced BCT from the Manning Meadow Reservoir brood to the stream. This brood was founded by a mixture of BCT from three remnant populations: Birch Creek in the Beaver River drainage (Ohlhorst 1991, Shiozawa et al. 1993, Evans and Shiozawa 2004), Water Canyon in the Virgin River drainage (Behnke 1976, Klar 1978, Thompson 1987), and Reservoir Canyon in the Virgin River Drainage (Behnke 1976, Thompson 1987, Shiozawa and Evans 1994).

The Devils Den wildfire burned the lower portion of Oak Creek canyon, adjacent to the fish-bearing portion of the stream, in August 2006. Two floods in early October 2006 eliminated all trout below the confluence with Limekiln Canyon, although some trout survived in the few hundred yards upstream between that confluence and Big Spring. Additional flooding during the 2007 monsoon season eliminated rainbow and brown trout stocked in the spring. BCT and brown trout were reintroduced from 2007 to 2010, while annual stocking of catchable-sized rainbow trout was resumed to sustain immediate recreational fishing.

Oak Creek was also affected by debris flows and flash floods following the 2012 Clay Springs fire, which burned most of the Oak Creek watershed. These floods appeared to eliminate all trout from Oak Creek with the exception of small brown trout in the short stream reach between the main drainage channel and Big Spring. Because previous surveys had found that brown trout tended to overpopulate in Oak Creek, yielding low mean size, an attempt was made to mechanically remove those that remained by electrofishing. Dense aquatic vegetation and silty substrate in the spring source channel hampered removal effort, though it was attempted twice. No fish were found in the three established electrofishing stations, though sampling in between stations was not possible. With the belief that there was a complete loss or removal of non native trout, GMU staff chose to advance efforts to establish BCT in Oak Creek, which were stocked annually from 2014 to 2016. It was hoped that BCT would replace brown trout as a recruiting species, be less likely to overpopulate, and achieve greater mean size. Sterile rainbow and tiger trout were stocked annually to help satisfy recreational angling interest. Personnel believed that this combination would reduce competition pressure and allow for development of a BCT population.

Non native brook trout were removed from Deep Creek (Fig. 3) in the San Pitch Mountains near Levan in fall 2011. BCT were transferred in 2012 from the remnant population in Salina Creek (Evans and Shiozawa 2004, 2005, 2007, 2008) of the middle Sevier River drainage to Deep Creek. This is the closest remnant BCT population, by stream connection, to the lower Sevier River drainage. The Deep Creek population marked the first and only replication of the Salina Creek BCT remnant.

A 2002 contracted riparian survey observed suitable trout habitat and limited grazing impact in the North Fork of Corn Creek (Fig. 4) on the southern end of the Pahvant Plateau (Petty 2002). These results prompted FNF staff to take a closer look at the stream. A 2005 survey found that a small cascade was preventing brown trout from invading more than the lowest 1.0 km (0.6 mi) of North Fork Corn Creek. FNF staff confirmed in 2007 that the stream was fishless above this cascade and likely had been since a wildfire in 1996. Plans were then formulated to restore BCT to North Fork Corn Creek, but restoration was delayed by the discovery of a limited number of brown trout above the cascade in 2008.

BCT restoration in North Fork Corn Creek was completed in 2012 through several activities (Hadley et al. 2012). The cascade was replaced by two loose rock barriers and brown

trout were removed by rotenone treatment. The treatment focused on just 0.8 km (0.5 mi) of stream upstream of the barriers. North Fork Corn Creek has been observed repeatedly to experience subsurface flow for approximately 0.6 km (0.4 mi) in the lower reach during late summer and fall (Appendix Fig. A1). This dewatered section prevented further upstream invasion by brown trout and helped reduce removal efforts. BCT from Skunk Creek in the Clear Creek drainage (Middle Sevier River HUC) were transferred to North Fork Corn Creek and stocked near the confluence with Leavitts Canyon. The Skunk Creek remnant was confirmed to be 97% pure (3% introgression from rainbow trout) earlier in 2012 (Evans et al. 2012).

METHODS

All known populations of BCT in the lower Sevier River drainage were sampled during 2019 using backpack electrofishing units (Smith-Root models 12-B, LR-24, and/or LR-20B) (Fig. 2). UDWR and FNF personnel conducted surveys when stream conditions allowed for effective sampling. Surveys were generally conducted at a similar time of year as previous surveys. One to three stations were electrofished in each stream. The target length of each station was 100 m, though the exact length was modified as needed to fit available habitat and allow for effective sampling. Fish populations were sampled in each station using the multiple-pass removal method (Zippin 1958). We attempted to collect all trout, though young-of-the-year were excluded from full analysis. Total length (TL) (mm) and weight (g) were recorded for all trout collected.

Mean wetted stream width (m) was determined by measuring ten random transects within each survey station. Population estimates were calculated by the program MicroFish 3.0 (Demo Version) (Van Deventer 1989). Stream dimensions were combined with population estimates and mean trout weight to calculate trout density (fish/km, fish/hectare) and biomass (kg/ha). Upstream and downstream ranges of BCT were determined in each surveyed stream through electrofishing, ocular observation, or professional judgment. Range locations and stream distances were determined with a global positioning system (GPS) unit, US Geological Survey topographical maps, and ArcGIS® software (by Esri). Reaches currently occupied by BCT were classified as occupied habitat. Trout biomass and distribution were compared to results from previous surveys, if available. Trends were classified as increasing, decreasing, or stable, depending if current values differed by more than 10% from previous surveys.

RESULTS

Survey results were compiled by stream with tables listing BCT abundance and biomass at specific stations, along with maps showing the distribution of native trout (Appendix A). BCT was the only species observed in Deep Creek, while rainbow, brown, and tiger trout were observed in Oak Creek, in addition to BCT. No fish were observed in North Fork Corn Creek. Oak Creek demonstrated the greatest amount of habitat occupied by BCT (3.0 km; 1.9 mi), while North Fork Corn Creek had the greatest amount of potential habitat (up to 10.0 km; 6.2 mi). Oak Creek is the largest of the three streams, as identified by mean stream width (4.05 m). Deep Creek provides just 2.4 km (1.5 mi) of habitat but exhibited the highest levels of BCT density (1,725 per ha) and biomass (146 kg per ha). Deep Creek was also the only stream where recent BCT recruitment was evident and multiple age classes were present. All BCT observed in Oak Creek measured at least 190 mm (7.5 in) in total length and exhibited the greatest mean size and condition. BCT occupied the full amount of available habitat in both Deep and Oak creeks and have likely done so since shortly after introduction. Between these two streams, BCT occupied a total of 5.4 km (3.4 mi) in the lower Sevier River drainage.

BCT was the only trout species observed at every station in Oak Creek though, overall, rainbow trout exhibited slightly higher abundance and biomass (Table 2). Brown trout – the only fertile species present besides BCT – were documented only at Station 3 but equaled BCT in abundance there. The only previous surveys conducted after BCT introduction in the three streams occurred in Oak Creek (Table 1); however, none of those surveys documented BCT.

DISCUSSION

North Fork Corn Creek

The years following the 2012 introduction of BCT to North Fork Corn Creek yielded some of the lowest levels of annual precipitation in recent history. This stream is known to experience periodic subsurface flow even during years with normal precipitation. Streams in the Great Basin are highly dependent on snowpack for flow maintenance, but late summer monsoon storms can also exert significant influence on water volume. For example, the winter of 2018-19 yielded the highest snowpack in many years but the 2019 monsoon season was very limited and North Fork visibly lost flow between the two survey trips in July and September. Thanks to a combination of factors, reduced flow likely occurred regularly in the stream between 2012 and 2019 and may have limited the ability of a limited number of transferred BCT to establish a

population. Travertine deposits in lower Hell Hole Canyon and observations made during a reconnaissance survey in 2007 indicate that this reach sustains the most consistent and highest base stream flow and likely would have provided the best habitat for the introduced fish in 2012. Instead they were stocked near Leavitts Canyon, where periodic reduced flow is evident.

Though the initial attempt to restore BCT in North Fork Corn Creek failed, the amount of potential BCT habitat offered by this stream is more than two times greater than the combined habitat in the other two streams in the lower Sevier basin, even when periodic de-watering is considered. Accordingly, a second introduction was attempted in fall 2019 with the stocking of 4,000 fingerling BCT produced by the Manning Meadow brood. These fish were spread from the barriers to the lower end of Hell Hole Canyon. Additional introductions will be made in 2020 and 2021 to ensure occupation by multiple BCT cohorts. Use of pack animals for transport will allow for targeted introduction in higher, less accessible stream reaches.

Deep Creek

Despite having the shortest length of potential habitat and lowest stream flow among the lower Sevier BCT streams, Deep Creek currently supports the highest abundance of native trout and the only evidence of recruitment. This population is even more important as it represents the only replicate of the Salina Creek BCT remnant. *Myxobolus cerebralis*, the parasite that causes whirling disease, was detected in Salina Creek in 2013. Further replication of that population can only occur through egg collection because the disease is not communicated through gametes, though attempts to collect BCT eggs from other southern Utah streams have been unsuccessful. While it is believed that improved techniques for streamside egg collection will eventually be developed, this will be delayed for several years due to other, higher-priority BCT conservation and spawning efforts already scheduled. The replicate population in Deep Creek provides valuable redundancy until other expansions of the Salina Creek remnant can be attempted.

Oak Creek

The original goal of stocking BCT in Oak Creek was to diversify recreational angling opportunity with native fish. Stocking BCT after additional losses of non native trout to fires and flooding was considered an opportunistic attempt to increase native trout presence in an area where few populations existed without having to conduct time-consuming fish removal. It was hoped that BCT would replace brown trout as the stream's recruiting species, while sterile trout would help satisfy other angling interests. Brown trout were not entirely eradicated by flooding,

however, and while brown trout abundance is not currently high, prior experience in Oak Creek shows that the species is very capable of expanding and dominating the fish community. Rainbow and tiger trout are just seasonally abundant in Oak Creek but likely contribute to increased competition during the summer months. Those BCT that have survived in Oak Creek exhibited exceptional growth and condition in 2019. The lack of younger cohorts, however, demonstrates that BCT have experienced limited recruitment success. All BCT observed almost certainly resulted from stocking between 2014 and 2016. Oak Creek is primarily fed by Big Spring, producing consistent flow in fall and winter that is ideal for promoting brown trout spawning. A smaller snowmelt component and lower potential for peak spring flow than the typical BCT stream also reduce BCT's competitive potential for recruitment when brown trout are abundant. Resource competition with both fertile and sterile trout species has also likely contributed to the recruitment failure. Ultimately, if full establishment of BCT is desired for Oak Creek, adjustment to stocking quotas and/or removal of brown trout will be necessary.

CONCLUSION

An updated range-wide Conservation Strategy and Agreement for BCT finalized in 2018 (BCT Conservation Team 2018) will help direct future conservation focus within the Southern Bonneville GMU. The new strategy adopts Trout Unlimited's (TU) Conservation Portfolio approach to securing range-wide, long-term persistence by spreading risk of loss to various factors (e.g. invasive species, environmental change, etc.) across a variety of habitats, populations, and management approaches (Haak et al. 2011). Within this approach, range-wide subspecies security is achieved through promotion of genetic integrity, life history diversity, and geographic (or ecological) diversity, backed by large patches of interconnected habitat for resiliency. The Portfolio recommends Shafer and Stein's (2000) "3-R" conservation principles as an adaptable framework to guide development of goals and objectives for BCT conservation within each GMU that help achieve this strength through diversity. These principles include **representation** (preserving existing elements of diversity), **resiliency** (having sufficiently large populations and intact habitats to facilitate recovery from large disturbances) and **redundancy** (preserving enough different populations so that some can be lost without jeopardizing the subspecies).

Securing representation of existing diversity is currently precluded in the lower Sevier River drainage because no remnant BCT populations are known to occur there. Although there

exists a high potential of genetic introgression from non native trout in unexplored headwaters on the Pahvant Plateau, attempts should be made to survey these areas and investigate resident trout identity. The stream systems in the drainage are characterized by a high level of fragmentation, both natural and manmade, and this lack of connectivity limits the opportunity for increasing overall BCT resiliency through creation of large metapopulations. Chalk and Corn creeks are the only streams in the lower Sevier basin that contain tributary systems, though they still may not be sufficient for creating desired resiliency. These systems also sustain popular recreational fisheries for non native trout and, because aquatic resources are already so limited in the area, replacing any of these fisheries may not be supported by the public. In addition, other large projects already completed (ie. Clear Creek) or being conducted (Mammoth Creek, upper East Fork Sevier River) in other Southern Bonneville drainages are targeted at achieving resiliency at the GMU scale. The main focus of current BCT populations in the lower Sevier River drainage is providing redundancy of BCT across the landscape. Deep Creek provides valuable redundancy for the Salina Creek remnant. Because Manning Meadow BCT are abundant throughout the GMU, the value of the Oak Creek and North Fork Corn Creek populations is limited at that scale. There is value, however, in having some representation of BCT in all areas because it provides the public with the opportunity to interact with and gain an appreciation for native trout.

The 2018 BCT Conservation Strategy laid out restoration projects required to achieve a suitable level of recovery for the Southern Bonneville GMU. These projects lie outside the lower Sevier River drainage and no other restoration projects are recommended for the drainage at this time. Instead, conservation efforts should focus on maintaining, enhancing, or solidifying the current populations. Because stream resources in the lower Sevier drainage are limited, those efforts will also be limited when compared to other portions of the GMU. Small-scale, opportunistic restoration projects will be considered on a case-by-case basis after GMU-scale BCT conservation shifts from dedicated restoration to maintenance. Some of the streams in the lower Sevier basin may be ideal for this type of project (eg. Meadow Creek, Pioneer Creek, Second Creek), though implementation will depend on prioritization of limited personnel time and value compared to other similar opportunities throughout the Southern Bonneville GMU. These priorities could be adjusted if any BCT population was found within the basin with sufficient genetic integrity to warrant conservation action for recovery. It is recommended that any future BCT restoration undertaken in the lower Sevier River drainage – beyond securing

and/or expanding a remnant population – should involve public input regarding the desire for such restorations and acceptable locations.

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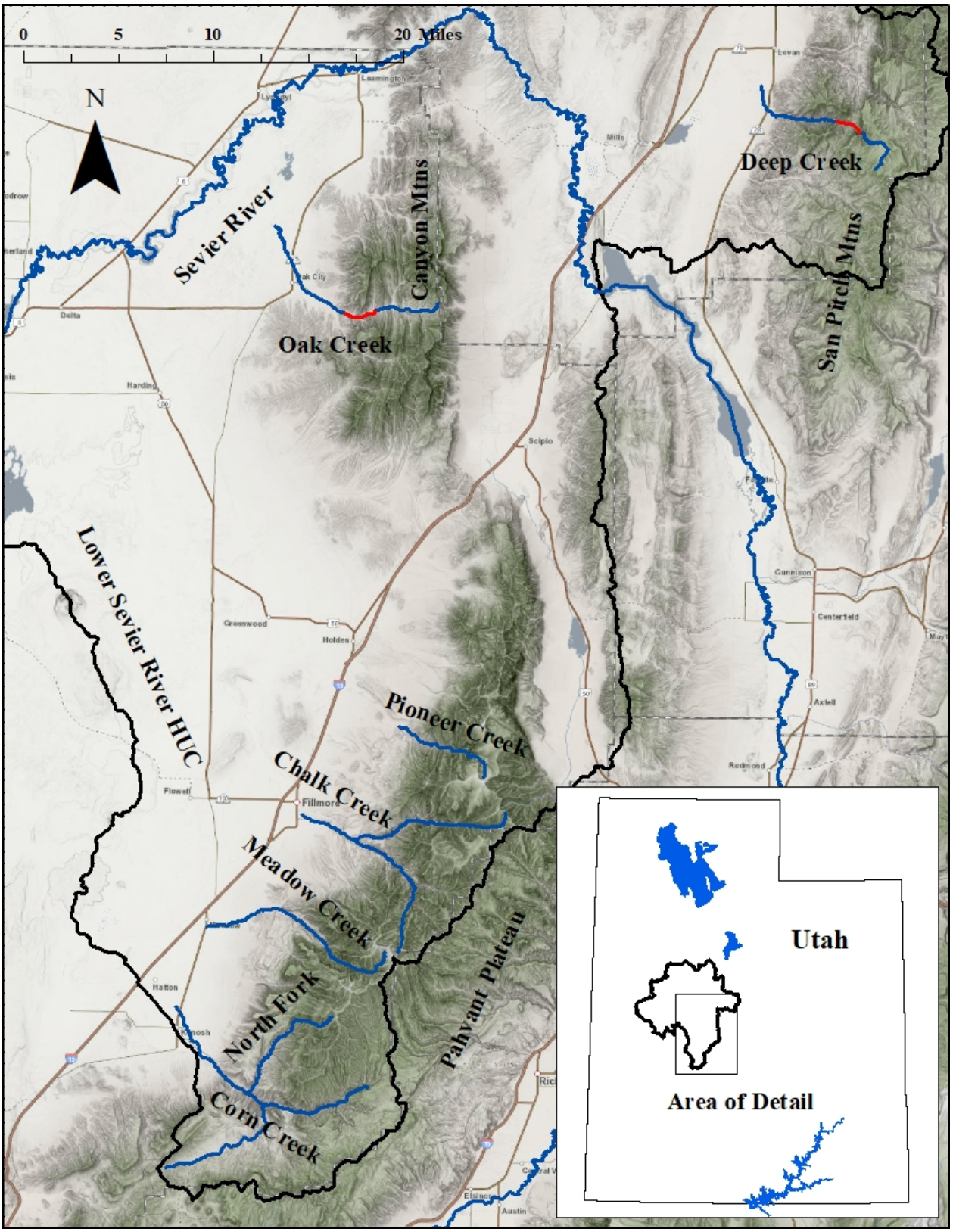

Figure 1. The Lower Sevier River drainage (HUC 16030005) of central Utah. Current (2019) BCT distribution highlighted in red.

Figure 2. Personnel conduct an electrofishing survey in Oak Creek.


Figure 3. Deep Creek.


Figure 4. North Fork Corn Creek.

Table 1. Comparison, where possible, of Bonneville cutthroat trout population status in the lower Sevier River drainage by individual stream, 2007-2019. Trends noted as an increase (↑) or decrease (↓) if values changed by more than 10%. Biomass presented is a mean of all sampling stations where BCT were detected.

State water identification number	Stream/tributary (indentation denotes tributaries)		Occupied Habitat		Biomass		
		Year	km	Trend	kg/ha	Trend	Comments
VI AA 070A	Corn Creek, NF	2019	0	--	0	--	Restoration attempted in 2012
VI AA 080B	Deep Creek	2019	2.4	--	146	--	BCT restored 2012
VI AA 040A	Oak Creek	2007	3.0	--	0	--	BCT introduced in 2005
		2014	3.0	↔	0	--	Repeated flooding
		2019	3.0	↔	24	↑	Dominated by other species

Table 2. Comparison of mean abundance and biomass of trout species observed in Oak Creek in 2019.

Parameter	Bonneville Cutthroat Trout	Rainbow Trout	Tiger Trout	Brown Trout
Fish per km	57	67	10	30
Fish per ha	132	141	27	60
Biomass (kg per ha)	24	31	10	8

APPENDIX A

Survey results and maps for individual streams (coordinates are presented in NAD83 datum)—contained in the following pages as outlined below by drainage, stream, and tributary:

Corn Creek, North Fork—NATIVE TROUT POPULATION SURVEY

1. General Information— Date: **July 23 and Sep 5, 2019** Biologist: **M. Hadley, J. Swensen**
2. Stream Information—
   Name, catalog #, section, county: **North Fork Corn Creek, VI AA 070A, 01, Millard**
3. Survey Site Information (see attached map)—
   Upstream range of native trout (general description and GPS): **NA**
   Downstream range of native trout (general description and GPS): **NA**
   Location (GPS) and description of barriers: **Lower barrier—120381700E 4291153N; Upper barrier—120381726E 4291188N**
   Stream Length—Occupied habitat: **0 km (0 mi)** Available habitat: **up to 10.0 km (6.2 mi)**
   Survey method & equipment: **backpack battery electrofisher; single-pass census**
   Survey sites (general description and UTM)—
      Station 1: **0.5 km (0.4 mi) upstream of barriers; 120381890E 4291715N**
      Station 2: **Leavitt's Canyon confluence; 120383000E 4293805N**
      Station 3: **In Hell Hole Canyon[1], 0.3 km (0.2 mi) upstream of confluence; 120385008E 4295631N**

Parameter	**Station 1**	**Station 2**	**Station 3**
Station length (m)	100 m	100 m	100 m
Mean stream width (m) (n)	2.36 m (10)	1.80 m (10)	1.08 m (10)
Station area (hectares)	0.0236 ha	0.0180 ha	0.0108 ha
BCT			
Removal Pattern	0	0	0
Population estimate (95 % CI)	0 (NA)	0 (NA)	0 (NA)
Capture probability	NA	NA	NA
Mean length (mm) (n)	NA	NA	NA
Mean weight (g) (n)	NA	NA	NA
Mean KTL (n)	NA	NA	NA
Number fish per km (95 % CI)	0 (NA)	0 (NA)	0 (NA)
Number fish per ha (95 % CI)	0 (NA)	0 (NA)	0 (NA)
Biomass (kg per ha) (95 % CI)	0 (NA)	0 (NA)	0 (NA)

4. Comments: Stream was dry in September 2019 from 120382081E 4292411N to 120382031E 4291845N (0.6 km). This section typically experiences annual subsurface flow.
[1] – The majority of perennial stream flow comes from Hell Hole Canyon, rather than the tributary canyon designated as the North Fork.

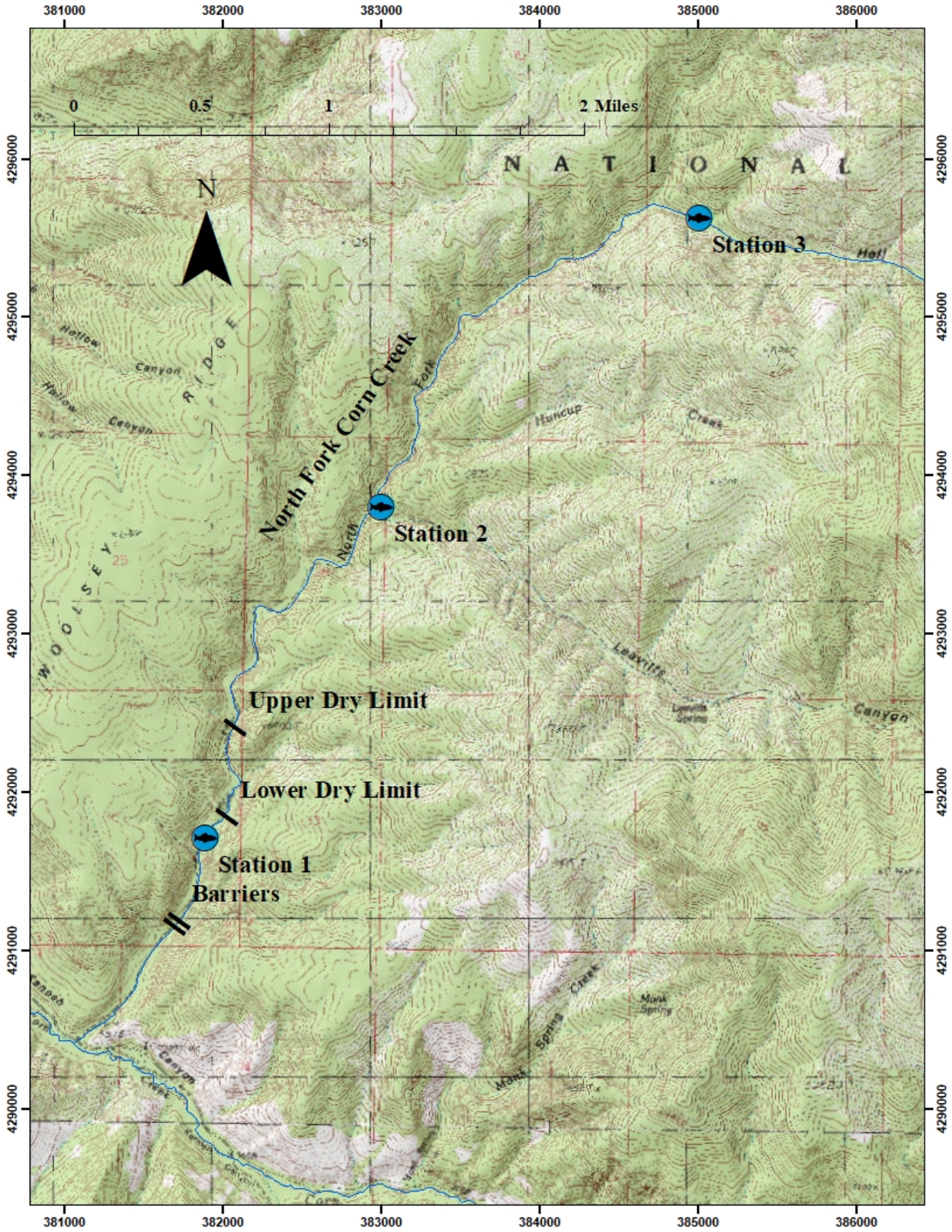

Figure A1. Location of BCT survey stations and barriers in North Fork Corn Creek.

Deep Creek—NATIVE TROUT POPULATION SURVEY

1. General Information— Date: **Oct 10, 2019** Biologist: **M. Slater, J. Swensen, M. Hadley**
2. Stream Information—
   Name, catalog #, section, county: **Deep Creek, VI AA 080B, 01, Juab**
3. Survey Site Information (see attached map)—
   Upstream range of native trout (general description and GPS): **Limited flow and habitat upstream of 120433052E 4372028N**
   Downstream range of native trout (general description and GPS): **Diversion—120431054E 4373009N**
   Location (GPS) and description of barriers: **Diversion**
   Stream Length—Occupied habitat: **2.4 km (1.5 mi)** Available habitat: **2.4 km (1.5 mi)**
   Survey method & equipment: **backpack battery electrofisher; multiple-pass depletion**
   Survey sites (general description and UTM)—
      Station 1: **End of FR 0149, start of ATV trail; 120431235E 4372939N**

Parameter	**Station 1**
Station length (m)	61 m
Mean stream width (m) (n)	1.71 m (10)
Station area (hectares)	0.0104 ha
BCT	
Removal Pattern	18 0
Population estimate (95 % CI)	18 (NA)
Capture probability	1.000
Mean length (mm) (n)	196 (18)
Mean weight (g) (n)	85 (18)
Mean KTL (n)	1.07 (18)
Number fish per km (95 % CI)	295 (NA)
Number fish per ha (95 % CI)	1,725 (NA)
Biomass (kg per ha) (95 % CI)	146 (NA)

4. Comments: Young of the year abundant.

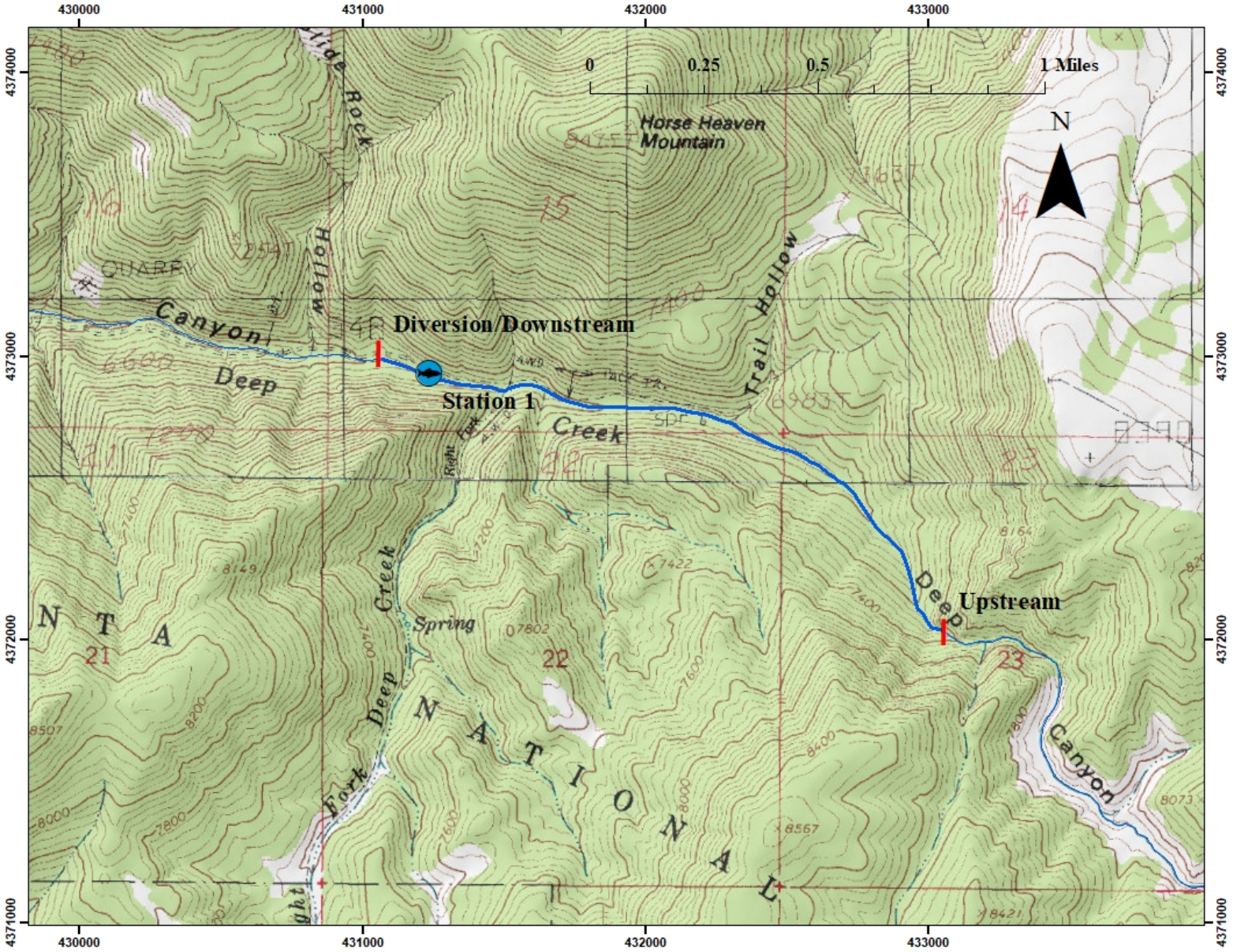

Figure A2. Locations of survey stations, barriers, and BCT distribution in Deep Creek.

Oak Creek—NATIVE TROUT POPULATION SURVEY

1. General Information— Date: **July 22-29, 2019** Biologist: **J. Swensen, M. Hadley**
2. Stream Information—
   Name, catalog #, section, county: **Oak Creek, VI AA 040A, 02, Millard**
3. Survey Site Information (see attached map)—
   Upstream range of native trout (general description and GPS): **Big Spring—120391906E 4356725N**
   Downstream range of native trout (general description and GPS): **Diversion—120389283E 4356725N**
   Location (GPS) and description of barriers: **Diversion**
   Stream Length—Occupied habitat: **3.0 km (1.9 mi)** Available habitat: **3.0 km (1.9 mi)**
   Survey method & equipment: **backpack battery electrofisher; multiple-pass depletion**
   Survey sites (general description and UTM)—
      Station 1: **100 m upstream of diversion; 1203889384E 4356686N**
      Station 2: **0.9 km (0.6 mi) upstream of diversion; 120390094E 4356370N**
      Station 3: **0.2 km (0.1 mi) downstream of Big Spring; 120391861E 4356714N**

Parameter	**Station 1**	**Station 2**	**Station 3**
Station length (m)	100 m	100 m	100 m
Mean stream width (m) (n)	3.92 m (10)	3.27m (10)	4.98 m (10)
Station area (hectares)	0.0392 ha	0.0327 ha	0.0498 ha
BCT			
Removal Pattern	5 1	2 0	9 0
Population estimate (95 % CI)	6 (±1)	2 (NA)	9 (NA)
Capture probability	0.857	1.000	1.00
Mean length (mm) (n)	259 (6)	248 (2)	224 (9)
Mean weight (g) (n)	211 (6)	193 (2)	152 (9)
Mean KTL (n)	1.20 (6)	1.26 (2)	1.22 (()
Number fish per km (95 % CI)	60 (±10)	20 (NA)	90 (NA)
Number fish per ha (95 % CI)	153 (±26)	61 (NA)	181 (NA)
Biomass (kg per ha) (95 % CI)	32 (±6)	12 (NA)	28 (NA)

4. Comments:
Additional Species Observed

	Rainbow Trout[1]		**Tiger Trout**		**Brown Trout**
Station(s)	1	3	2	3	3
Fish per km	40	160	20	10	90
Fish per ha	102	321	62	20	181
Biomass (kg per ha)	32	62	19	12	23

[1] – Stocked shortly before surveys.

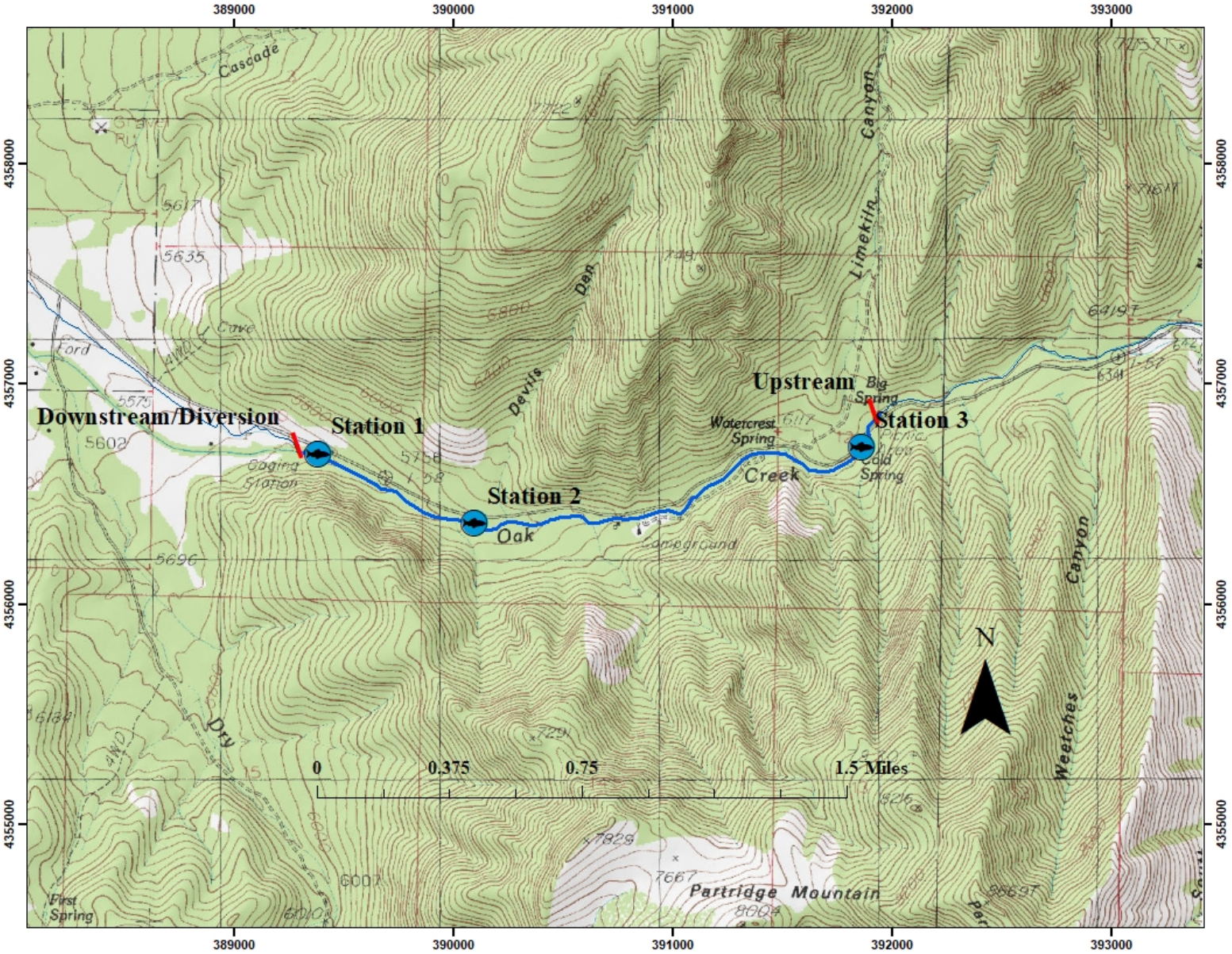

Figure A3. Locations of survey stations, barriers, and BCT distribution in Oak Creek.