

NEVADA DEPARTMENT OF WILDLIFE
STATEWIDE FISHERIES MANAGEMENT



FEDERAL AID JOB PROGRESS REPORTS

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2018

Third Creek
Lahontan Cutthroat Trout Feasibility Study

WESTERN REGION



**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
ANNUAL PROGRESS REPORT**

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**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
ANNUAL PROGRESS REPORT**

State: Nevada
Project Title: Statewide Fisheries Program
Job Title: Third Creek Lahontan Cutthroat Trout Feasibility Study
Period Covered: January 1, 2018 through December 31, 2018
Timeframe: July 1, 2015 through June 30, 2019

SUMMARY

This is the final year and final report of the *Third Creek Lahontan Cutthroat Trout Feasibility Study*. It was initiated in FY2015 to document spawning activity of spring spawning rainbow trout in Third and Incline creeks on an annual basis. One finding showed multiple fish having site fidelity by returning to the same stream year after year to spawn. Furthermore, this study utilized eggs from adfluvial caught fish and the progeny were raised in a hatchery. They were then released back into Lake Tahoe and a number were sampled the following spawning season in these same tributary streams. Building off these findings, a new study entitled the *Lake Tahoe Lahontan Cutthroat Trout Feasibility Study* was initiated on July 1, 2018 and is the next step in understanding the capabilities of Lahontan cutthroat trout (LCT). The study uses the same strategies to observe LCT behavior and performance in a contemporary Lake Tahoe environment and is a step towards finding a solution for recovery.

The winter of 2017/18 finished near average for the Lake Tahoe Basin, however, an extremely wet spring led to an erratic runoff pattern that led to a challenging spawning season in Third Creek. Many spawning challenges consisted of high flows followed by frigid temperatures and the dismantling of a temporary fish barrier on Third Creek.

Beginning in July and continuing through November, monthly single pass electroshocking surveys were conducted at three transects on Third and Incline creeks. Fish were identified, measured, and released unharmed at each transect. Brook trout, rainbow trout, brown trout, and kokanee salmon made up the complex of sportfish found, while speckled dace, Tahoe sucker, tui chub, and Lahontan reddsides made up the nongame component. Species sampled corresponded with their expected spawning-run times. Young-of-the-year rainbow trout were also sampled in both creeks in numbers rebounding from the four-year low in 2017.

A temporary fish migration barrier was installed on Third Creek directly below Lakeshore Blvd in March. Due to the extremely high runoff, it was dismantled the second week of May during the spawning season. While the barrier was operating, 25 adfluvial rainbow trout were captured in the downstream reach.

In February, a Biomark submersible PIT tag reader was installed approximately 40 feet upstream of the Third Creek terminus into Lake Tahoe. The reader passively monitored for of previously tagged fish throughout the spawning season.

BACKGROUND

Lake Tahoe is situated along the eastern portion of the Sierra Nevada Mountains, and approximately 30 percent of the lake lies within Nevada. It is 22 mi long and 12 mi wide, has 123,300 SA, holds 122,160,280 AF of water, has a maximum depth of 1,645 ft, and an average depth of 989 ft. A natural rim occurs at 6,223.0 ft above MSL, but a permanent concrete dam built in 1913 extends the lake elevation to 6,229.1 ft above MSL.

Since its discovery in the 1880's, many species of fish have been introduced into Lake Tahoe for expanding angling opportunities. Rainbow trout *Oncorhynchus mykiss* was first stocked in 1885. Lake trout (mackinaw) *Salvelinus namaycush* was presumed to be stocked as early as 1888. Brook trout *Salvelinus fontinalis* was introduced in 1891 as were Atlantic salmon *Salmo salar*. Chinook salmon *Oncorhynchus tshawytscha* was first stocked in 1910 and silver salmon *O. kisutch* in 1913. The introduction of kokanee salmon, landlocked sockeye salmon *Oncorhynchus nerka*, was in 1949. Bonneville cisco *Prosopium gemmiferum* was stocked in 1964 to expand the food base of lake trout. Other introduced fishes include brown trout *Salmo trutta*, largemouth bass *Micropterus salmoides*, brown bullhead *Ictalurus nebulosus*, mosquito fish *Gambusia affinis*, and golden shiner *Notemigonus crysoleucas*. However, many of these introductions quickly failed and today lake trout, rainbow trout, brown trout, and kokanee salmon represent the bulk of the sport fish community in Lake Tahoe. Increased sightings of largemouth bass from around the lake, on the other hand, suggest it is expanding into new habitats.

Native fish communities in Lake Tahoe consist of mountain whitefish *Prosopium williamsoni*, although it was also stocked abundantly in the early 1900's, Tahoe sucker *Catostomus tahoensis*, Lahontan mountain sucker *C. platyrhynchus*, speckled dace *Rhinichthys osculus*, Lahontan redbreast *Richardsonius egregius*, Lahontan tui chub *Siphateles bicolor pectinifer*, and Paiute sculpin *Cottus beldingii*. Lahontan cutthroat trout *Oncorhynchus clarkii henshawi* was native to Lake Tahoe. This fish once was very abundant and grew to 30 pounds, but the natural population was extirpated by the 1940's. Habitat disturbance, competitive interaction from introduced fishes, lack of spawning habitat resulting from tributary dewatering or impediments, and substantial commercial harvest have been noted to precipitate the extinction of LCT from Lake Tahoe.

Sixty-three tributaries enter Lake Tahoe including Third and Incline creeks, which are situated in Crystal Bay near Incline Village, Nevada. These tributaries are important for resident sport fishes (e.g., brook and rainbow trout), spawning of adfluvial fishes including native non-game fish, and rearing of juvenile fishes. These streams also play an increasing role in transporting nutrients into the lake. Within the Nevada portion of Lake Tahoe, Third and Incline creeks have been noted for the possibility of Lahontan cutthroat trout reintroduction; this study is ongoing to assess the feasibility of an introduction. The Truckee River is the only natural outlet from Lake Tahoe.

OBJECTIVES

- Install a temporary migration barrier on Third Creek downstream of Lakeshore Boulevard when rainbow and/or LCT utilize the creek for spawning, generally from March through May.
- Measure, weigh, sex, and tag (Floy and PIT) all rainbow trout captured downstream of the barrier. Once processing is complete, return fish into Lake Tahoe.
- Measure, weigh, sex, and tag (Floy and PIT) all Lahontan cutthroat trout captured downstream of the barrier. Once processing is complete, move all LCT upstream of the barrier.
- Conduct electroshocking surveys at three established transects monthly throughout the year in Third and Incline creeks to determine presence and relative abundance of native and non-native fish.
- Install a submersible PIT tag reader to monitor tagged lacustrine rainbow trout utilizing Third Creek during the spawning season.

PROCEDURES

Install a temporary migration barrier on Third Creek downstream of Lakeshore Boulevard. On March 27, 2018, half-inch aluminum pipe welded approximately one inch apart and in four-foot pieces were wired to T-posts into a temporary grated barrier across Third Creek. Boulders and rocks were used to firm up the base of the barrier to avoid heavy flows from washing out the structure. While the 2017/18 snowpack fell slightly below average for the region, a wetter than normal spring resulted in erratic run-off flows that lead to the barrier being washed out several times during the course of the project. The decision to dismantle the barrier was made during the first week of May, as it was no longer serving a functional purpose for the study.

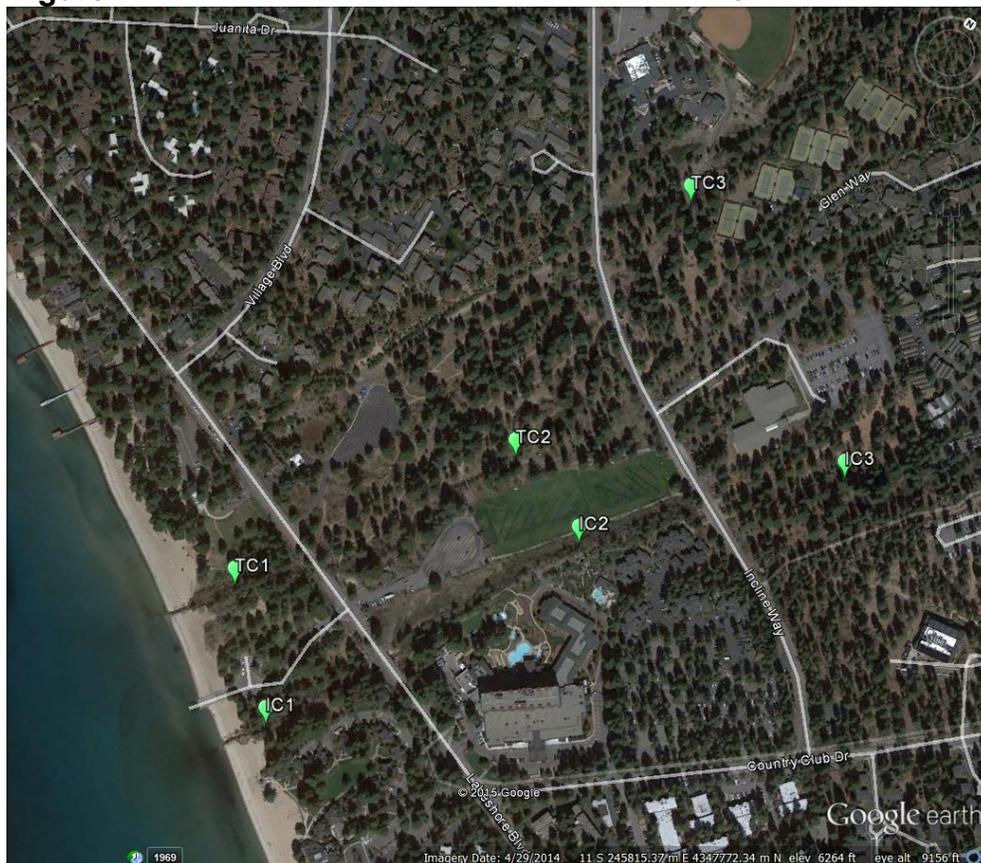
Measure, weigh, sex, and tag (Floy and PIT) all rainbow trout captured downstream of the barrier. Once processing is complete, return them to Lake Tahoe. Once the barrier was erected on Third Creek, daily trips were made to check for fish congregating directly downstream. If fish were observed below the barrier, a backpack electroshocker was used to stun and capture them. They were then placed into holding pens until all fish were captured. Fish were identified to species, measured to fork length, weighed, sexed, and given individual Floy and PIT tags. If a rainbow trout was determined to be ripe, it was anesthetized and hand spawned as part of the Lake Tahoe Rainbow Trout Study. Fish were then released unharmed into Lake Tahoe.

Once the barrier was removed due to extreme flow conditions, weekly trips were still made to Third Creek. Electroshocking was carried out from the lake to upstream approximately one mile in an attempt to capture adfluvial fish making a spawning run. Captured fish were identified to species, measured to fork length, weighed, sexed, and given individual Floy and PIT tags.

Measure, weigh, sex, and tag (Floy and PIT) all Lahontan cutthroat trout captured downstream of the barrier. Once processing is complete, move all LCT upstream of the barrier. No Lahontan cutthroat trout were captured in 2018.

Conduct electroshocking surveys at three established transects monthly in Third and Incline creeks to determine presence and relative abundance of native and non-native fish throughout the year. Beginning in July and continuing through November, monthly single pass electroshocking surveys were conducted at three established transects on Third and Incline creeks when time permitted. Transects on each creek were spaced approximately 0.25 miles apart, with the most downstream transect being located just upstream of Lake Tahoe (Figure 1). Transects were 200 feet in length and electroshocked in an upstream direction. All species captured were identified, measured, and released back into the creek unharmed. Flow rates and water temperatures were also recorded on each visit.

Figure 1. Transect Locations on Third and Incline Creeks.

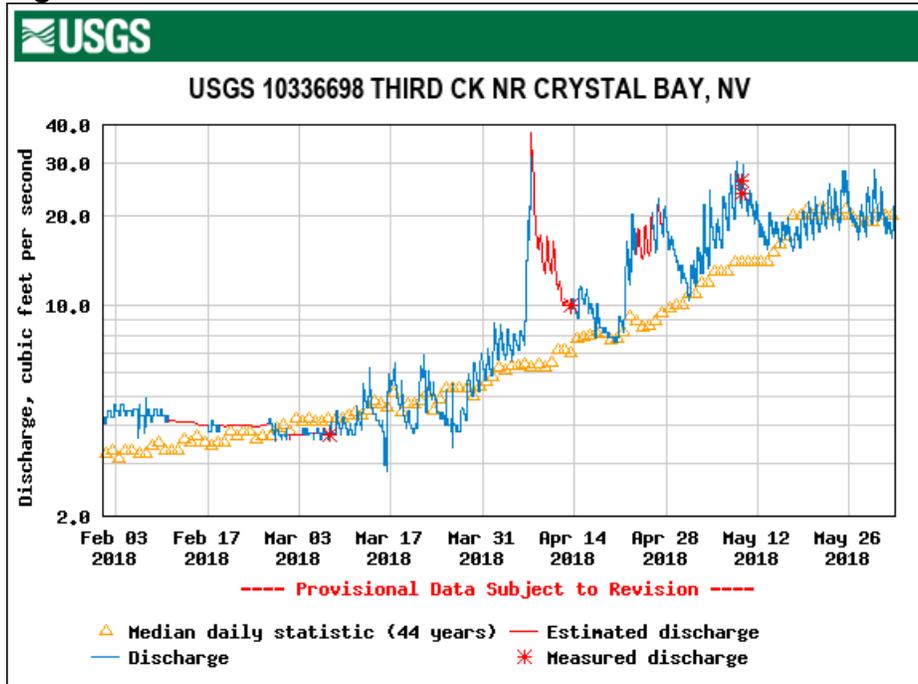


Install submersible PIT tag reader to monitor tagged lacustrine rainbow trout utilizing Third Creek during the spawning season. On February 27, 2018, a newly acquired Biomark submersible PIT tag reader was installed approximately 40 ft upstream of the Third Creek terminus into Lake Tahoe. The reader was anchored using cinder blocks and t-posts. Following installation, the reader was monitored daily (as time permitted) and weekly downloads of the data were collected.

FINDINGS

Install a temporary migration barrier on Third Creek downstream of Lakeshore Boulevard. The 2018 barrier functioned for 44 days during the adfluvial rainbow trout spawning season. A wetter than average spring resulted in an erratic run-off pattern (Figure 2) that led to the barrier washing out several times. Peak flow rates exceeding 40 cfs and sustained flows around 20 cfs made maintaining the structure nearly impossible. The decision was made to dismantle the barrier during the second week of May.

Figure 2.



Measure, weigh, sex, and tag (Floy and PIT) all rainbow trout captured downstream of the barrier. Once processing is complete, return them to Lake Tahoe. All adfluvial rainbow trout captured in Third Creek during the 2018 spawning season were checked for Floy and PIT tags. In Third Creek and its tributary Rosewood Creek, 25 rainbow trout were captured (Table 1).

The 2018 spawning run of tagged fish began on February 28, detecting a male rainbow trout that was initially tagged in 2016. This was approximately a month earlier than the first detection in 2017. If monitoring the run using past methodology (i.e., electroshocking survey), it appears that April 24 would have been the peak. However, the use of the PIT tag reader enables a more thorough monitoring of fish movement and the most fish activity entering Third Creek occurred from March 30 to April 10.

Since 2015, there have generally been two spawning peaks, with the first peak occurring around April 20 and the second around May 4 (Figure 3). This trend was observed again in 2018 when electroshocking. However, when using the PIT-tag reader,

there were still two activity peaks, but they occurred roughly two weeks earlier. This data is helpful moving forward as it will allow better timing to capture fish for spawning.

Since 2015, the number of fish captured has declined annually from a high of 59 fish to a low in 2018 of 25. Flow rates in 2015 were much lower and therefore more conducive to capturing adfluvial fish than during the following three years having higher spring runoff. The above winter snow pack in 2016 and 2017 and erratic runoff in 2018 made collecting fish for spawning extremely difficult. The installation of the submersible PIT tag antennae in 2018 made it feasible to monitor tagged adfluvial fish as they entered the mouth of Third Creek. While only a small number of fish were caught during the spawning period by electroshocking, there was actually a much larger number of fish accessing the tributary. Of 11 previously tagged fish that were detected on the tag reader, only three were captured. This data suggests that the capture efficiency for adfluvial rainbow trout in Third Creek is extremely low and, while it appears the numbers are declining annually, it may actually be a function of difficult sampling conditions and not a decline in the overall population.

Table 1. Third Creek Barrier – Tagged Rainbow Trout Data.

	n	FL (mm)	Weight (g)
M	27	447	1149
F	32	472	1121
2015	59		
M	16	374	693
F	14	476	1310
2016	30		
M	16	373	766
F	11	450	1102
2017	27		
M	14	376	757
F	11	439	1066
2018	25		

During the spawning run in 2018, 25 percent of the fish captured were recaptures from one of five tagging events. Fish either were tagged directly streamside during the 2015, 2016, and 2017 spawning runs in Third and Incline creeks or were tagged and stocked at Cave Rock boat ramp in 2016 and 2017 (2,000 tagged each year) that were offspring of fish spawned from Third and Incline creeks in 2015 and 2016. For the purposes of analysis, recaptured fish have been separated into two groups, 1) recaptured adfluvial wild fish ($n=3$) and 2) fish hand spawned and raised to catchable size in the hatchery ($n=6$).

Of the three recaptured adfluvial wild fish in 2018, two were males and one a female. Two were recaptured for the first time since their initial tagging (one in 2016 and the other in 2017), while the third fish was captured for the third time since its initial capture in 2015. Growth ranged from 13 mm (2nd year capture 2017) to 118 mm (3rd year capture 2015). Based on the recapture data, it appears that female fish return to the same stream during spawning, whereas males move in and out of both Third and Incline

tributaries. All but one was recaptured in the same stream initially found. One male was initially tagged in Third Creek in 2017 and then recaptured in Incline Creek in 2018.

Figure 3.

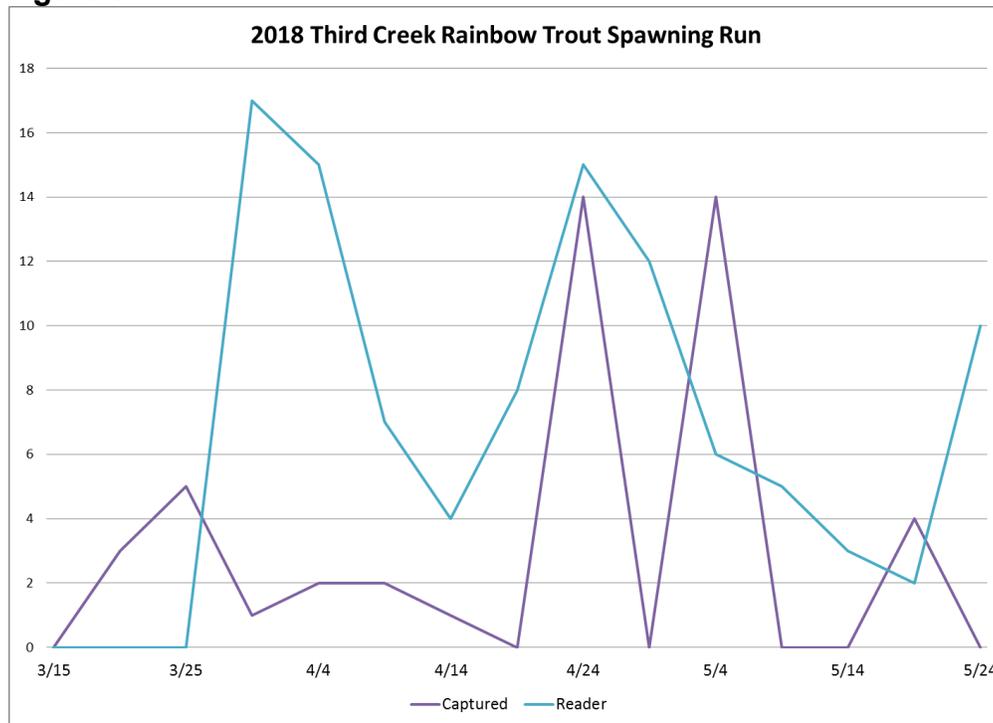


Table 2. Adfluvial Rainbow Trout Recapture Data

2nd Year Capture	Capture Date	Mark Date	Initial Capture	Recapture (mm)	Growth	K Factor
Third (M)	4/5/2018	4/20/2016	455	485	30	
Incline (M)	4/27/2018	4/20/2017	460	473	13	0.95
Average			458	479	22	0.95
3rd Year Capture	Capture Date	Mark Date	Initial Capture	Recapture (mm)	Growth	K Factor
Third (F)	4/27/2018	4/21/2015	410	518	118	1.21
Average			410	518	118	1.21

During 2018, six fish caught during the spawning season were offspring of wild adfluvial fish spawned in 2015 and 2016. Additionally, two other fish from these lots also were incidentally captured during a post-spawning August survey. These fish were marked with yellow and red individually numbered Floy tags and stocked at Cave Rock in Lake Tahoe in 2016 and 2017. During tagging, a subset of fish were measured so average growth rates could be estimated. Five fish were two years old (red Floy tag) and grew an average of 75.4 mm since the time of stocking. The maximum observed growth was 117 mm, while the minimum was 49 mm. Four of the fish were captured in Third Creek/Rosewood Creek, while the remaining trout was caught in Incline Creek. Two of these fish were captured during the August survey (post spawn), the same time a large influx of redbside shiners were observed. It suggests that lacustrine rainbow trout move into tributaries to follow the forage. Three yellow-tagged trout were also caught and were

the offspring of fish spawned in 2015. These three-year old fish grew an average of 95.3 mm since they were stocked, ranging from 44 to 131 mm. Two were captured in Incline Creek and the third came from Third Creek.

All eight of the hatchery-reared Incline strain rainbow trout were males. For the second consecutive year, these trout were captured ascending Third and Incline Creek tributaries. This data suggests stocked fish are capable of persisting and carrying out their life cycle in Lake Tahoe and tributaries. This has potential to translate to Lahontan cutthroat trout within the Lake Tahoe system.

Table 3. Recapture Data of Hatchery Born Incline Strain Rainbow Trout.

Capture Location	Sex	Capture Date	Tagging (mm)	Capture (mm)	Growth	mm/month
Red Floy tag - Spawned in 2016, stocked in September of 2017						
Third	M	3/27	229	260	31	4.4
Incline	M	4/27	229	278	49	6.1
Rosewood	M	4/10	229	346	117	14.6
Third	M	8/1	229	330	101	9.2
Third	M	8/1	229	308	79	7.2
Average			229.0	304.4	75.4	8.3
Yellow Floy tag - Spawned in 2015, stocked in September of 2016						
Third	M	4/3	286	330	44	2.4
Incline	M	3/22	268	399	131	7.7
Incline	M	5/22	254	365	111	5.8
Average			242.4	364.7	95.3	5.3

Measure, sex, weigh, and tag (Floy and PIT) all Lahontan cutthroat trout captured downstream of the barrier. Once processing is complete, move all LCT upstream of the barrier. No Lahontan cutthroat trout were captured downstream of the barrier or during other surveys during 2018.

Conduct electroshocking surveys at three established transects monthly in Third and Incline creeks to determine presence and relative abundance of native and non-native fish throughout the year.

Incline Creek

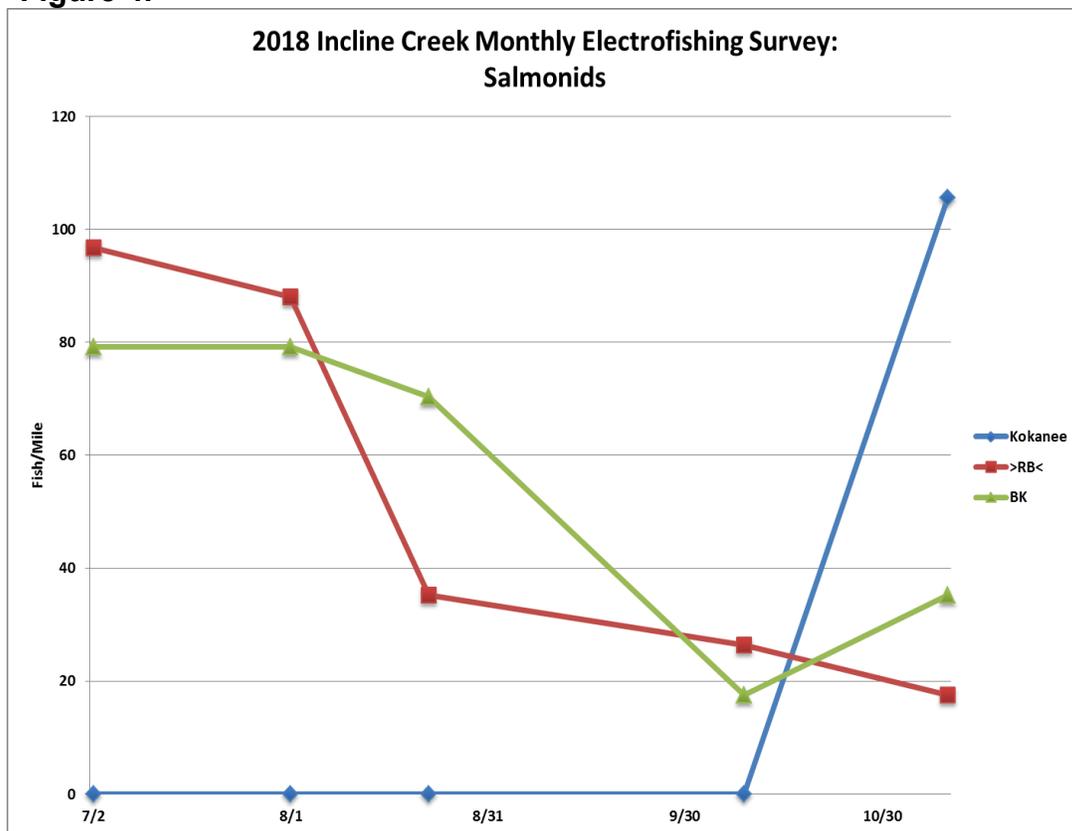
During the 2018 surveys in Incline Creek, all expected species of salmonids were found. Rainbow trout, brook trout, and kokanee salmon were sampled in at least one of the monthly surveys. As with previous years, brook trout and fluvial rainbow trout (those between 100 and 300 mm for purposes of this study) were consistently the most prevalent species sampled. Kokanee salmon were sampled during fall spawning as expected, but in lower densities than observed in 2017 (Figure 4). No adfluvial rainbow trout (those greater than 300 mm for purposes of this study) were sampled in Incline Creek this year; however, 11 were captured during the spawning season (March through May).

Lahontan reddsides, speckled dace, Tahoe suckers, and tui chub made up the composition of native nongame species during post-spawn surveys. Most species saw

small density influxes during their respective spawning periods outside of tui chub, which was sampled at the lowest transect on August 1 (Figure 5). Densities of non-game fish were higher this year than from previous years due to a more typical summer flow regime possibly allowing for easier access. This was the first time tui chub were caught since this project began in 2015.

As mentioned previously, adfluvial rainbow trout were not sampled during post-spawning surveys. However, a spot-shocking survey in early May documented adfluvial rainbow trout upstream of IC3, which was the farthest upstream these fish have been sampled. The capture of the stocked offspring of wild adfluvial fish hand-spawned in 2015 creates confidence that these fish can survive and carry out their life history in Lake Tahoe.

Figure 4.



Third Creek

As with Incline Creek, rainbow trout, brook trout, brown trout, and Kokanee salmon were found since 2015 in fluctuating densities. However, no mountain whitefish were detected in 2018. Fluvial rainbow trout and brook trout were the most prevalent species sampled during monthly surveys (Figure 6). Two adfluvial rainbow trout were captured on August 1 at the lowest Third Creek transect (TC1). For the first time since this study was initiated in 2015, a brown trout was sampled in Third Creek, captured upstream of TC1 during the May spot-shocking survey.

Figure 5.

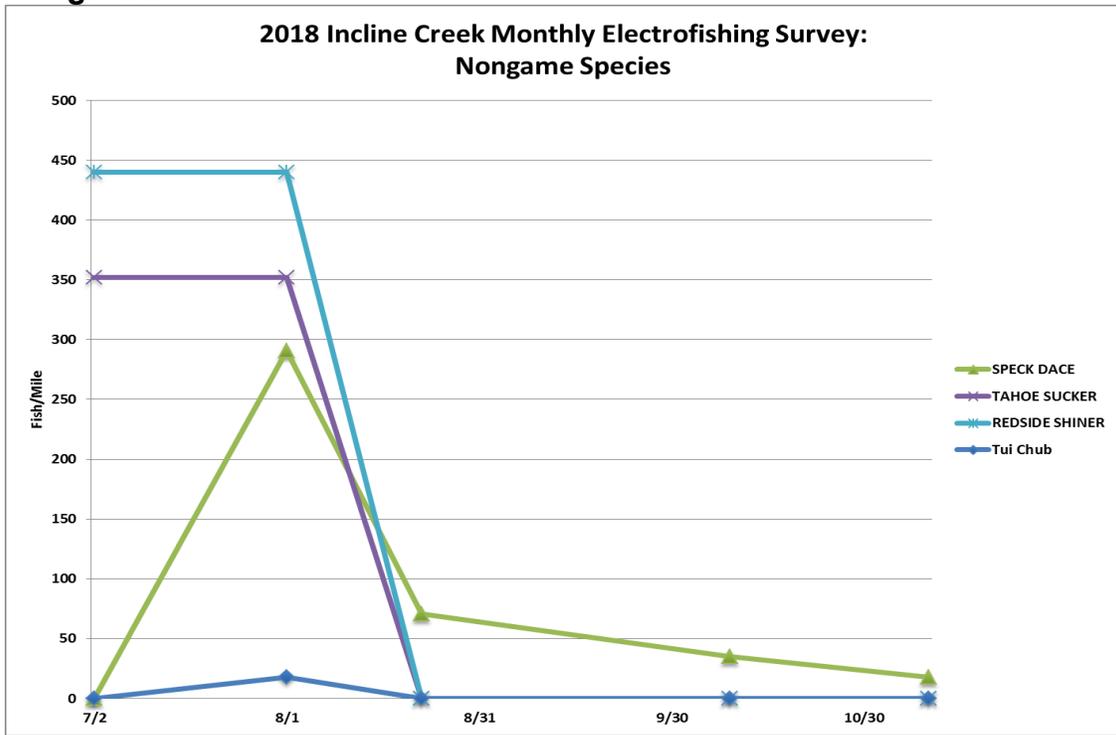
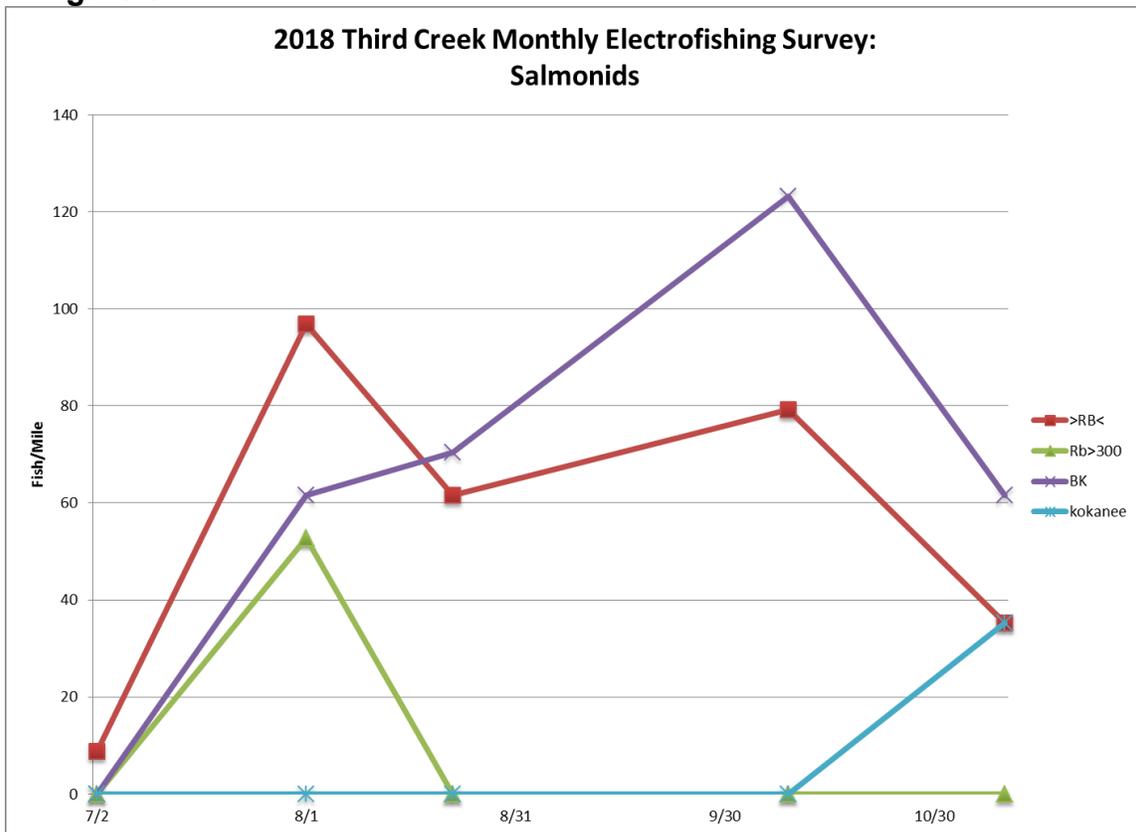
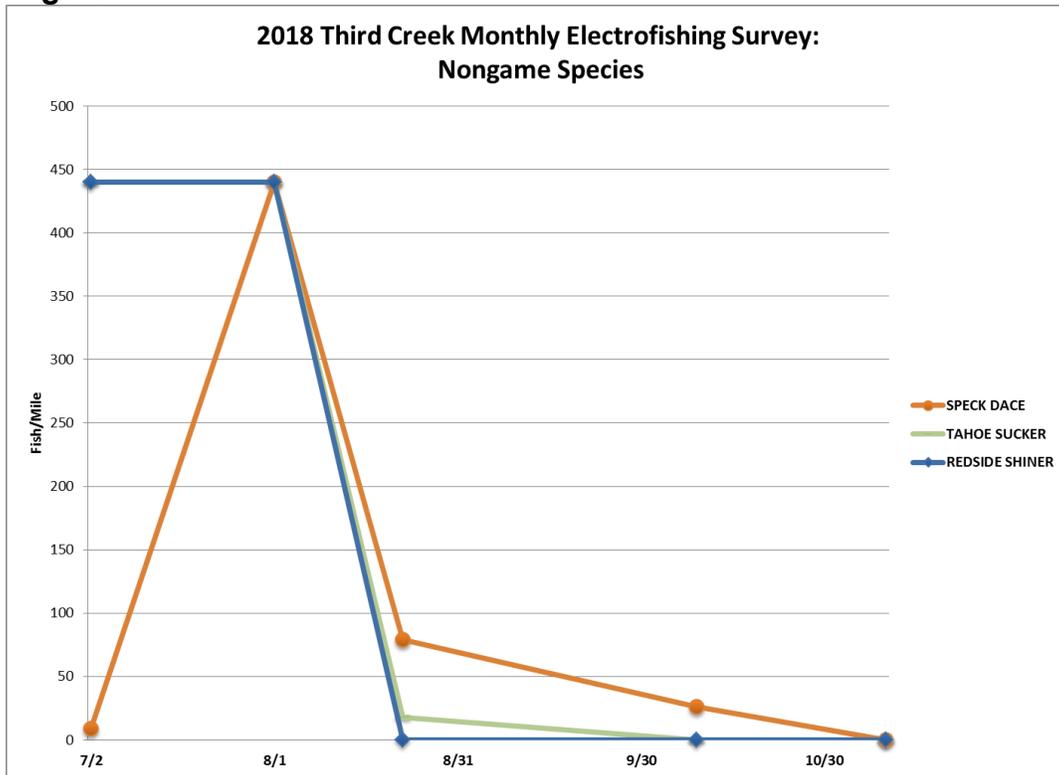


Figure 6.



Native nongame species (Tahoe sucker, Lahontan redbreast, and speckled dace) were first detected during in July and remained at TC1 through the end of October (Figure 7). A single Tahoe sucker was sampled at TC2 during the August survey, which was the farthest upstream this species has been detected.

Figure 7.



Adfluvial rainbow trout was sampled throughout the spawning period in Third Creek. Due to erratic flows, the temporary migration barrier that was installed in March washed out several times resulting in adfluvial fish moving freely throughout Third Creek. Fish were captured in both Third Creek and Rosewood Creek, with several recaptures from fish stocked in 2016 and 2017. This provides evidence that hatchery reared trout can persist and contribute to the Lake Tahoe fisheries.

The recruitment documented from the 2017 monthly surveys was the lowest record since the 2015 inception of this project. It was speculated that extreme flows hindered adfluvial rainbow trout from successfully spawning. The 2018 season brought better runoff (although erratic) and the level of recruitment observed returned to that found in previous years (Figure 8 and 9). In Third Creek, the recruitment level was second highest in the five years (behind 2014); while in Incline Creek, a similar recruitment level was seen during two other years. YOY rainbow trout in Third Creek appears to emerge later in the season than in Incline Creek. With the return to a more normal runoff in 2018, recruitment has returned to a level more in line with the five-year average. It is becoming more apparent that recruitment within these two Lake Tahoe tributaries is highly dependent on flow rates and water temperatures.

Figure 8.

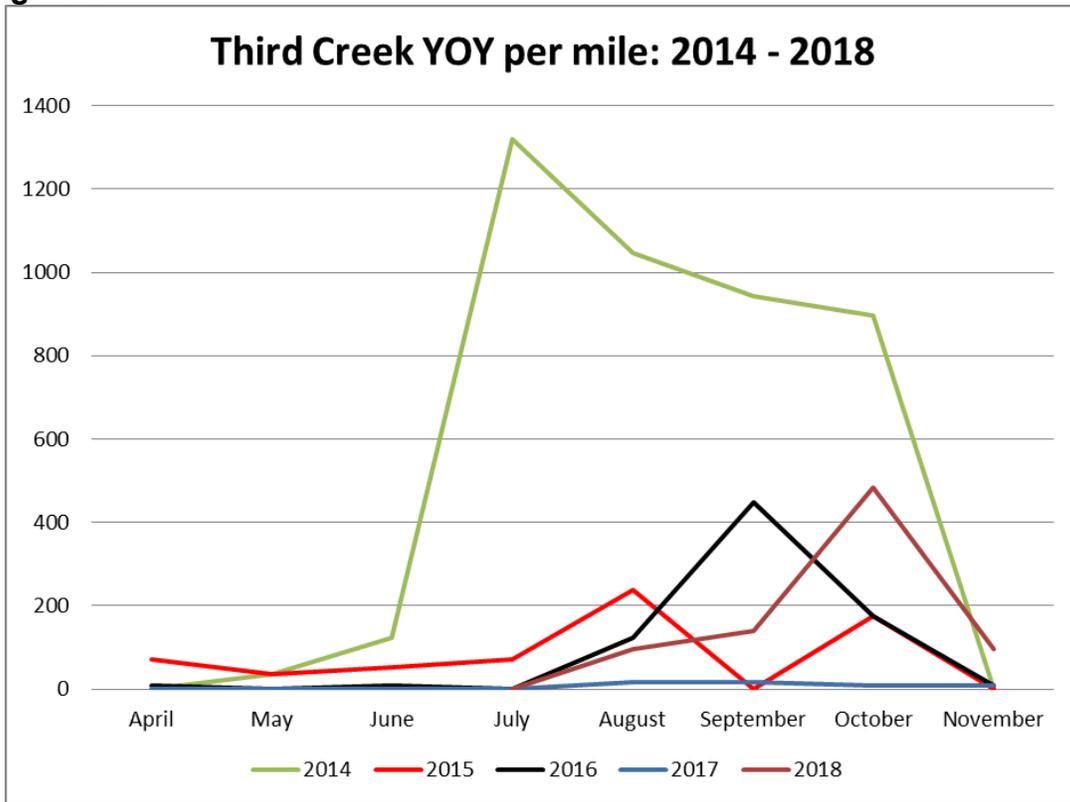
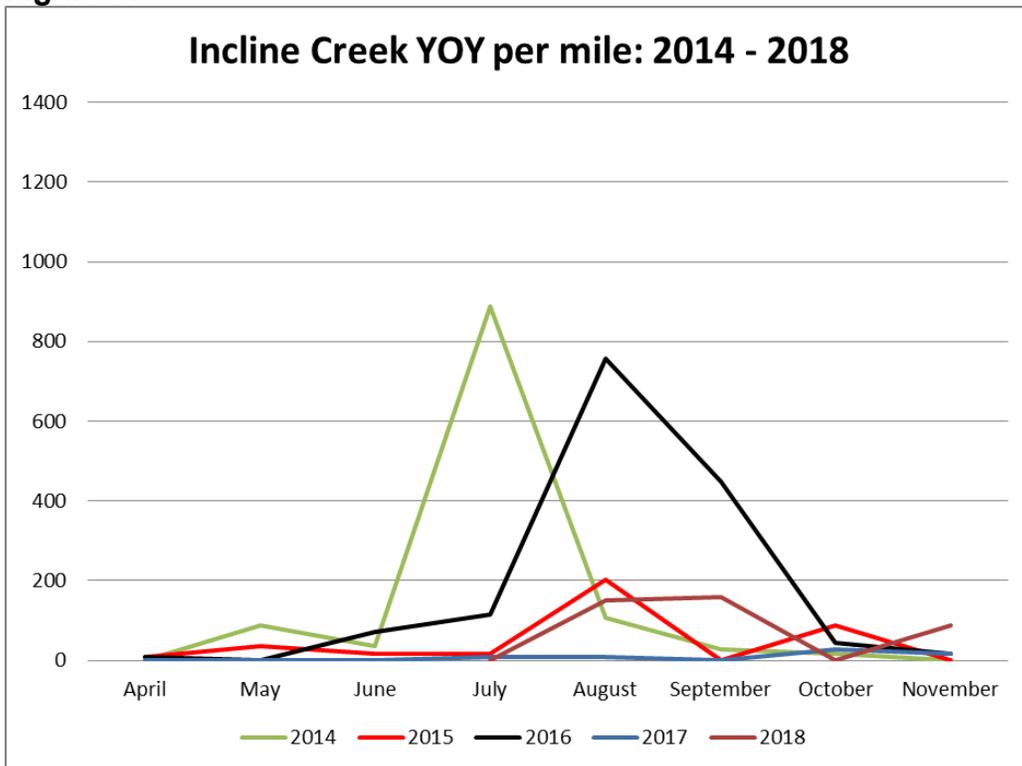


Figure 9.



Data collected throughout the study has established that, in general, resident fluvial fish are present in streams year-round and are not subject to similar seasonal fluctuations in abundance that adfluvial spawners and YOY (<100 mm) exhibit. In 2018, the fluvial rainbow trout population was about 25 percent of what it was during 2014, however, it increased substantially from what was observed in 2017 (Table 4). It appears that the fluvial rainbow trout population is also influenced by environmental conditions (flow rate and water temperature). Brook trout populations in Third Creek followed a similar trend, further lending to the belief that trout populations are highly variable depending on environmental conditions from one year to the next.

Table 4. Third Creek Fluvial Rainbow Population (Fish/Mile) Trend Over Time.

	2014	2015	2016	2017	2018	% decline from 2014
Fluvial Rb	222	75	48	13	56	-74.8
Bk	258	280	217	7	63	-75.5

Install submersible PIT tag reader to monitor tagged lacustrine rainbow trout utilizing Third Creek during the spawning season. A Biomark Submersible PIT tag array was installed near the Third Creek terminus in Lake Tahoe on February 27, 2018. This array allowed for passive monitoring of previously tagged wild rainbow trout as they entered and exited Third Creek. From February 28 to May 30, the tag reader had 113 detections, 26 were unique (only identified once). Of these unique hits, only 11 were recaptures from previous years and representing 7.9 percent of the 140 wild rainbow trout PIT tagged since this study began in 2015. The remaining 15 were detections from newly tagged fish moving out of Third Creek and back into Lake Tahoe. This data indicates a number of fish are entering Third Creek to spawn and are never being captured at the temporary barrier or electroshocked. Because only a subset of the actual population is PIT tagged, it is suspected there is a large number of undetected fish coming to spawn in Third Creek.

The average number of individual detections of tagged fish was 4.4 and ranged from 1 to 20 times. Of the 11 recaptured fish, the average time between the first and last detection was 18.5 days, with a range from 1 to 82 days. This data is slightly skewed resulting from one male that was detected entering or exiting the system 20 different times over 82 days. It is unknown whether the presence of the upstream migration barrier was the reason for multiple detections and frequent movement of individuals. Attachment 1 shows a summary of this detection data.

STUDY REVIEW

With an average winter in 2017/18, the snowpack and flow conditions in Third Creek were once again suitable for adfluvial rainbow trout to ascend the tributary in the spring for spawning. The installation of a temporary barrier was carried out and maintained for 44 days; however, there were several occasions where flow spikes resulted in washing out the barrier. Fish, then, had access to the upper reaches of the study area. It has been a common occurrence over the course of this study for the barrier to wash out and it is unrealistic to expect full containment of adfluvial rainbow trout from gaining upstream access and spawning.

For the third consecutive year, tagged adfluvial rainbow trout were recaptured in Third Creek during the spawning season. Three recaptures were documented, one for a third time over the four years of this study. This demonstration of limited site fidelity may prove useful as it relates to the potential of Lahontan cutthroat trout exhibiting the same behavior. Showing repeat spawning behavior also suggests that long-term survival of adfluvial fish is possible regardless of the numerous challenges it may have in Lake Tahoe. More data is needed in this area of the study.

Maintaining the fish barrier (weir) posed a challenge again in 2018. Adfluvial rainbow trout were able to move upstream of the barrier during several “blow out” periods and were assumed to have successfully spawned. When analyzing the numbers of fluvial rainbow trout in Third Creek, it appears that they have rebounded from the four-year low in 2017. This increase in abundance may have been due to a better winter in 2016/17, which resulted in the limited success in maintaining the barrier and a number of fish successfully spawning in the upper reaches. When looking towards a goal of having a self-sustaining LCT population in Lake Tahoe, one of the primary difficulties is reducing non-native salmonid populations enough to allow LCT to become established. After four years of manipulating the Third Creek system and hoping to eliminating adfluvial fish spawning in the upper reaches (excluding 2017 and 2018), there has been a substantial decline in resident rainbow trout abundance. Continuing with the study and monitoring fluvial rainbow trout will further our knowledge as to our ability to manipulate non-native salmonids within small streams of Lake Tahoe.

The YOY rainbow trout observed in Third Creek appear to have returned to a more normal level in 2018. This appears to be almost entirely dependent on environmental conditions. The extremely high flow experienced in 2017 led to washing out of redds and an immediate flushing of fry that potentially emerged. In 2018, normal flows in spring and summer allowed for a successful spawn and higher observed recruitment. An annual spike in YOY rainbow trout typically occurred in late summer or early fall and is most likely attributed to fish being of larger size and easier to catch. Interestingly, fluvial rainbow trout abundance in Third Creek, on average, spikes about a month later than in Incline Creek. This may be related to runoff, water temperature or other stream specific factors. Alternatively, it may result from the barrier on Third Creek stopping fish from migrating farther upstream until later in the season when it is removed. This is something that will need to be explored in 2019.

During the summer of 2016 and 2017, 4,000 individually tagged rainbow trout were stocked at the Cave Rock boat ramp in Lake Tahoe. These fish were the offspring of wild, adfluvial rainbow trout hand spawned from Third Creek in 2015 and 2016. This was part of the “Lake Tahoe Rainbow Trout Study” designed to monitor their performance in the lake. An interesting and extremely promising development initially observed in 2017 and again in 2018 was the capture of these fish in Third or Incline creeks during subsequent spawning seasons. This second year of repeat data is encouraging as it further supports that hatchery raised fish have the ability to survive and spawn in tributaries around Lake Tahoe. While LCT has not been stocked in recent years, the potential exists to have them stocked again and to monitor the tributaries for individuals

trying to migrate and spawn the same as hatchery rainbow trout. Third Creek provides the best spawning habitat along the Nevada portion of Lake Tahoe, and if fish stocked at Cave Rock and Sand Harbor are able to identify this tributary for spawning, it is a positive sign for LCT to become self-sustaining. Once LCT is stocked, individuals should be PIT tagged and research and monitoring are needed to assess their survival and attempts at spawning.

The installation of a Biomark Submersible Antenna in 2018 proved invaluable as it shed light on the actual movements of adfluvial fish migrating in and out of Third Creek. This data will enable us to tighten up our efforts to capture fish in Third Creek and have a better understanding of exactly how and when the creek is utilized, as well as what environmental factors possibly influences its use.

RECOMMENDATIONS

- Install a temporary migration barrier on Third Creek downstream of Lakeshore Boulevard.
- Measure, weigh, sex, and tag (Floy and PIT) all rainbow trout captured downstream of the barrier. Once processing is complete, return them to Lake Tahoe.
- Measure, weigh, sex, and tag (Floy and PIT) all Lahontan cutthroat trout captured downstream of the barrier. Once processing is complete, move all LCT upstream of the barrier.
- Conduct electroshocking surveys at three established transects monthly in Third and Incline creeks to determine presence and relative abundance of salmonids.
- Install a submersible PIT tag reader to monitor tagged adfluvial rainbow trout utilizing Third Creek during the spawning season.

Prepared By: Travis Hawks
Biologist III
Western Region

Date: December 4, 2018

Attachment 1

2018 Submersible PIT Tag Array Compiled Data

Scan Date	Scan Time	DEC Tag ID	Sex	Is Duplicate	Years Detected	Captured in '18	New in '18	Handle Date (2018)	Detections	Last Detection	Days Present
02.28.2018	20:07:07.120	900.118001049518	M		2016	x		4/5,4/27,5/22	20	5/22	82
03.09.2018	20:04:59.060	900.118001066810	M		2017				9	4/6	28
03.13.2018	22:48:30.720	900.118001049518		Yes							
03.31.2018	19:06:15.360	900.118001066810		Yes							
03.31.2018	19:29:58.560	900.118001049518		Yes							
03.31.2018	19:37:59.670	900.118001066810		Yes							
03.31.2018	20:51:56.760	900.118001038928	M		2017	x		4/27	7	4/19	27
04.01.2018	02:17:40.140	900.118001049518		Yes							
04.01.2018	02:19:13.940	900.118001038928		Yes							
04.01.2018	19:06:57.210	900.118001066810		Yes							
04.02.2018	18:28:48.780	900.118001033152	F		2016				1	4/2	1
04.02.2018	19:53:32.680	900.118001038928		Yes							
04.02.2018	20:46:39.010	900.118001066810		Yes							
04.02.2018	21:13:19.080	900.118001038928		Yes							
04.02.2018	22:28:53.180	900.118001049518		Yes							
04.02.2018	22:29:45.890	900.118001038928		Yes							
04.02.2018	22:32:18.220	900.118001049518		Yes							
04.02.2018	22:32:23.570	900.118001038928		Yes							
04.03.2018	19:22:03.390	900.118001049518		Yes							
04.03.2018	20:47:33.850	900.118001047373	M		2017				12	4/25	22
04.04.2018	22:41:38.500	900.118001066810		Yes							
04.05.2018	21:41:53.170	900.118001051110	F		2015, 2016, 2017				2	4/12	7
04.05.2018	21:48:40.110	900.118001066810		Yes							
04.05.2018	23:04:22.600	900.118001046193	F		2016, 2017				5	4/26	21
04.05.2018	23:26:29.850	900.118001047373		Yes							
04.06.2018	13:42:20.870	900.118001049518		Yes							
04.06.2018	13:46:20.740	900.118001066810		Yes							
04.06.2018	13:47:38.020	900.118001049518		Yes							
04.06.2018	13:50:38.030	900.118001066810		Yes							
04.06.2018	13:51:01.710	900.118001049518		Yes							
04.06.2018	18:22:12.990	900.118001047373		Yes							
04.07.2018	13:28:35.060	900.118001046193		Yes							
04.08.2018	05:02:21.890	900.118001049518		Yes							
04.08.2018	18:45:50.230	900.118001047373		Yes							
04.08.2018	20:52:39.440	900.118001046193		Yes							
04.09.2018	11:56:54.570	900.118001047373		Yes							
04.09.2018	18:12:58.810	900.118001049518		Yes							
04.09.2018	21:13:57.800	900.118001044974	F			X	X	4/5	1	4/9	
04.10.2018	03:31:35.150	900.118001047373		Yes							

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04.10.2018	14:26:26.420	900.118001049518		Yes							
04.12.2018	21:01:36.950	900.118001051110		Yes							
04.12.2018	23:57:25.910	900.118001047373		Yes							
04.14.2018	05:23:42.890	900.118001053282	M			X	X	4/10	10	5/10	
04.14.2018	20:01:23.290	900.118001046193		Yes							
04.15.2018	20:23:16.440	900.118001047373		Yes							
04.18.2018	02:14:34.600	900.118001049518		Yes							
04.19.2018	19:45:07.270	900.118001053282		Yes							
04.19.2018	21:46:09.400	900.118001047373		Yes							
04.19.2018	21:53:57.550	900.118001038928		Yes							
04.20.2018	23:14:19.890	900.118001047373		Yes							
04.21.2018	22:28:08.700	900.118001053282		Yes							
04.22.2018	00:08:36.920	900.118001047373		Yes							
04.22.2018	01:32:22.870	900.118001049518		Yes							
04.22.2018	18:53:19.590	900.118001055588	F		2015, 2016	x		4/27	1	4/22	1
04.23.2018	02:58:40.390	900.118001052614	F		2017				1	4/23	1
04.23.2018	06:43:47.100	900.118001049518		Yes							
04.24.2018	22:04:56.010	900.118001043451	F		2015, 2016				4	5/5	12
04.25.2018	20:11:23.580	900.118001047373		Yes							
04.26.2018	12:50:29.050	900.118001049518		Yes							
04.26.2018	19:15:02.710	900.118001046193		Yes							
04.27.2018	11:29:13.850	900.118001045034	M			X	X	4/27	2	5/7	
04.27.2018	12:01:15.980	900.118001052653	M			X	X	4/18	7	5/22	
04.27.2018	13:18:59.610	900.118001040043	F			X	X	4/27	2	5/26	
04.27.2018	20:25:00.730	900.118001043451		Yes							
04.27.2018	20:43:29.430	900.118001044338	F			X	X	4/27	2	5/2	
04.27.2018	21:27:04.070	900.118001048559	M			X	X	4/27	6	5/3	
04.27.2018	21:38:45.390	900.118001035130	F			X	X	4/27	4	5/25	
04.28.2018	04:52:30.940	900.118001053282		Yes							
04.28.2018	08:53:35.640	900.118001048559		Yes							
04.28.2018	20:54:51.100	900.118001053282		Yes							
04.28.2018	22:51:32.780	900.118001048559		Yes							
04.29.2018	04:17:29.120	900.118001053282		Yes							
04.29.2018	14:12:57.580	900.118001048559		Yes							
04.30.2018	16:20:49.750	900.118001049518		Yes							
04.30.2018	20:05:51.390	900.118001053282		Yes							
05.01.2018	01:48:40.070	900.118001052653		Yes							
05.01.2018	19:35:26.060	900.118001048559		Yes							
05.01.2018	20:21:42.720	900.118001052873	F		2015, 2016, 2017				1	5/1	1
05.01.2018	21:21:33.740	900.118001043451		Yes							

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05.01.2018	22:16:22.010	900.118001053282		Yes							
05.02.2018	19:23:45.100	900.118001044338		Yes							
05.02.2018	19:23:50.020	900.118001053282		Yes							
05.03.2018	08:52:17.400	900.118001048559		Yes							
05.05.2018	00:35:18.790	900.118001043451		Yes							
05.06.2018	18:47:40.460	900.118001052653		Yes							
05.07.2018	04:51:22.800	900.118001045034		Yes							
05.08.2018	08:48:06.480	900.118001052653		Yes							
05.08.2018	16:31:09.280	900.118001036122	M			X	X	5/8	2	5/10	
05.08.2018	17:38:57.400	900.118001053362	F			X	X	5/8	1	5/8	
05.10.2018	04:28:01.240	900.118001036122		Yes							
05.10.2018	22:35:10.870	900.118001053282		Yes							
05.11.2018	21:47:41.460	900.118001052653		Yes							
05.13.2018	07:33:41.710	900.118001047081	M			X	X	5/8	2	5/17	
05.13.2018	21:49:12.750	900.118001052653		Yes							
05.16.2018	02:05:40.240	900.118001035130		Yes							
05.17.2018	10:30:19.300	900.118001047081		Yes							
05.18.2018	15:46:47.800	900.118001049518		Yes							
05.22.2018	10:30:39.380	900.118001052653		Yes							
05.22.2018	18:55:22.450	900.118001049518		Yes							
05.24.2018	22:07:16.760	900.118001035130		Yes							
05.24.2018	23:29:48.110	900.118001050496	M			X	X	3/27	1	5/24	
05.25.2018	05:27:06.970	900.118001035130		Yes							
05.26.2018	04:14:49.940	900.118001040043		Yes							
05.26.2018	20:51:34.350	900.118001045698	M			X	X	3/25	4	5/30	
05.27.2018	23:52:09.080	900.118001045907	F			X	X	3/25	4	5/29	
05.27.2018	23:52:15.790	900.118001045698		Yes							
05.28.2018	04:03:00.040	900.118001045907		Yes							
05.28.2018	20:14:06.490	900.118001045698		Yes							
05.28.2018	21:10:01.230	900.118001045907		Yes							
05.29.2018	01:18:17.140	900.118001068267	M			X	X	4/27	2	5/30	
05.29.2018	02:06:19.720	900.118001045907		Yes							
05.30.2018	02:21:14.800	900.118001068267		Yes							
05.30.2018	12:30:37.330	900.118001045698		Yes							