

Friends of the Teton River 2021 Fisheries Report

Introduction

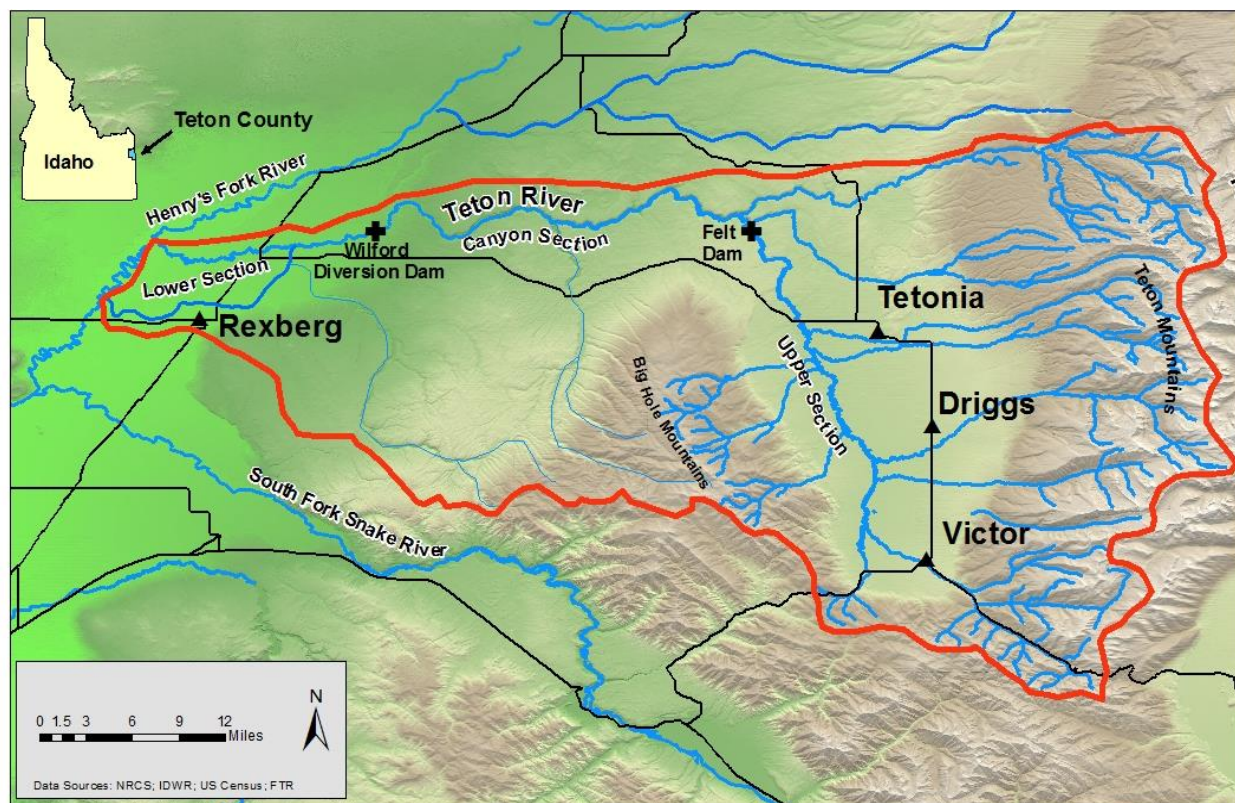
2021 provided a busy and productive field season for the Friends of the Teton River (FTR) Fisheries and Field monitoring program. In 2020 FTR conducted their watershed wide fisheries survey. The survey is completed once every 5 years in order to monitor trout populations in the Teton watershed tributaries. With that effort completed FTR was able to focus on our strengthening our ongoing annual monitoring programs. During the 2021 field season FTR maintained and monitored our PIT tag monitoring sites, conducted spawning trout survey's, maintained, and modernized fish screens, monitored non-native species and conducted population estimate surveys. Alongside that work FTR monitored the environmental conditions in the watershed by collecting stream temperature data and water quality information. Through our work this year FTR was able to strengthen our field monitoring program, and to better understand the Teton River fishery.

Teton River Population Estimates

In August and September FTR staff and volunteers assisted Idaho Fish and Game (IDFG) in the agencies semi-annual electrofishing surveys. IDFG uses raft-based electrofishing to collect trout population data on the mainstem of the Teton River. Electrofishing is a data collection technique used by fisheries biologists worldwide. The researcher uses a mobile unit mounted to a raft that sends an electric pulse through the water body, causing all the fish in the area to be temporarily stunned. The stunned fish are then collected by the field team, the data is recorded, and they are returned to the same stretch of stream. These surveys allow for IDFG and FTR to quantify the number of trout in the Teton, and to monitor for any changes to numbers of trout, and species composition of trout. These surveys are informational in that they allow managers to understand how conservation, restoration, drought, heat, and non-native fish impact the fishery.

FTR contributes to IDFG's survey by operating the "chase boat" who's crew measures, weighs, and records data on the fish that are captured. Furthermore, FTR collects genetic samples from captured fish, allowing for IDFG geneticists to analyze to detect hybridization and natal origins of Teton River Yellowstone Cutthroat trout. FTR also inserts passive integrated transponders (PIT tags) into trout captured during the survey. During this summer's PIT tagging efforts FTR tagged 471 trout. Those tagged fish can later be detected at FTR's PIT tag detection sites throughout the watershed.

This fall IDFG conducted population estimate surveys on four sections of the Teton River. Surveys were conducted on the Nickerson, Breckenridge, Buxton and South Fork of the Teton River. The Nickerson Section of the Teton River is the popular South Bates bridge to the Bates Bridge. The Buxton begins at the Buxton River Park and ends at Rainey River Park. The Breckenridge reach of the Teton River begins at Packsaddle Bridge and ends at the Harrops boat ramp. The final section of the Teton River that was surveyed was on the South Fork of the Teton River near Rexburg, ID. IDFG and FTR surveyed the stretch of the South Fork from 3300 (Orange Bridge) to the confluence with the Henry's Fork River.



Nickerson Results

Since surveys began in 1987 the Nickerson monitoring reach of the Teton river has been home to Yellowstone Cutthroat, Rainbow and Brook Trout. The Nickerson reach of the Teton River has historically had highest concentration of Yellowstone Cutthroat Trout (YCT). The 10 year average for YCT in the Nickerson reach is 383 YCT per mile. In the 2021 survey IDFG estimated that there are 370 YCT per mile. This down from the 2017 and 2019 surveys, and below the 10 year average. IDFG's total trout abundance estimate was 1,741 for the Nickerson reach in 2021. It should be noted that 5 BNT ranging from 212-370mm were caught during the 2021 survey. It was only the third survey during which a BNT were caught in the reach, with 2 BNT were caught during the 2019 survey, 3 in 2017 survey (IDFG 2021).

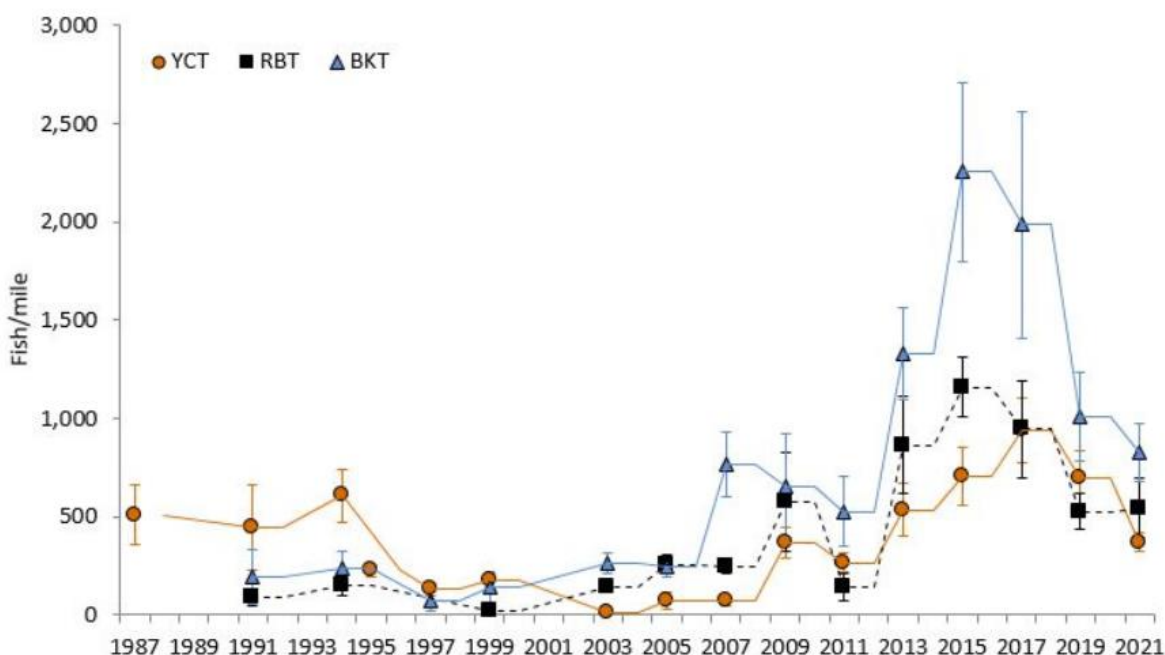


Figure 1. Abundance estimates and 95% confidence intervals from 1987 through 2021 for trout in the Nickerson monitoring reach, Teton River. YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, and BKT = Brook Trout.

 Jenn Vincent, IDFG

Breckenridge Reach

The Breckenridge reach of the Teton River is downstream of the Nickerson reach between Packsaddle and Harrops Bridges. The Breckenridge reach has been monitored for Yellowstone Cutthroat, Rainbow, Brook and Brown trout since 1987. In this years population estimate YCT were estimated at 56 YCT/mile, higher than the 10 year average, yet down from the 2019 survey. Throughout past surveys YCT numbers in the Breckenridge reach due partially to the lack of tributary streams by YCT to reproduce. Meanwhile Rainbow Trout abundance has decreased steadily since a high in 2014 to the 2021 estimate of 648 RBT/mile. The 10 year average for RBT is 909 RBT/Mile. The 2021 Brook Trout population estimate is 459 BKT/mile, which is close to the 10 year average of 426 BKT/mile. The Breckenridge of the Teton River is the first section of the Teton that managers found non-native Brown Trout. The first Brown Trout was found by IDFG in 1987, but BNT were not caught in significant numbers until 2007 when 28 were caught. Since 2007 Brown Trout numbers in the reach have increased substantially, with catches of 145 BNT in 2019, and 165 in 2021. The 2019 survey was the first survey during which an abundance estimate was created, at 177 BNT/mile. In 2021 the abundance estimate for BNT has yet again increased to 192 BNT/mile.

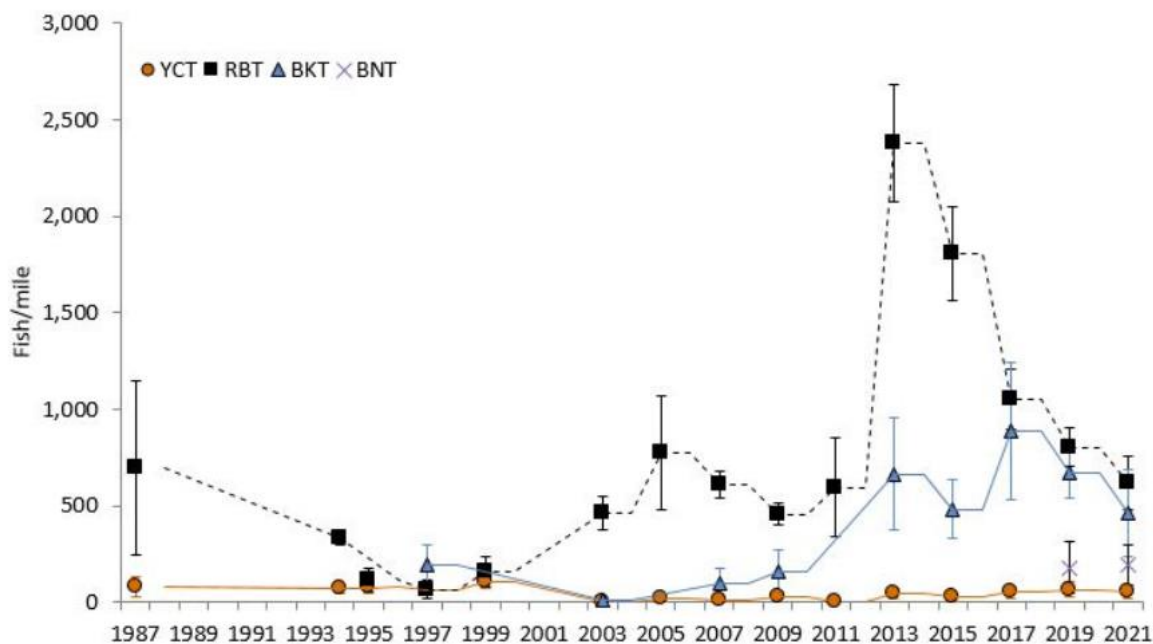
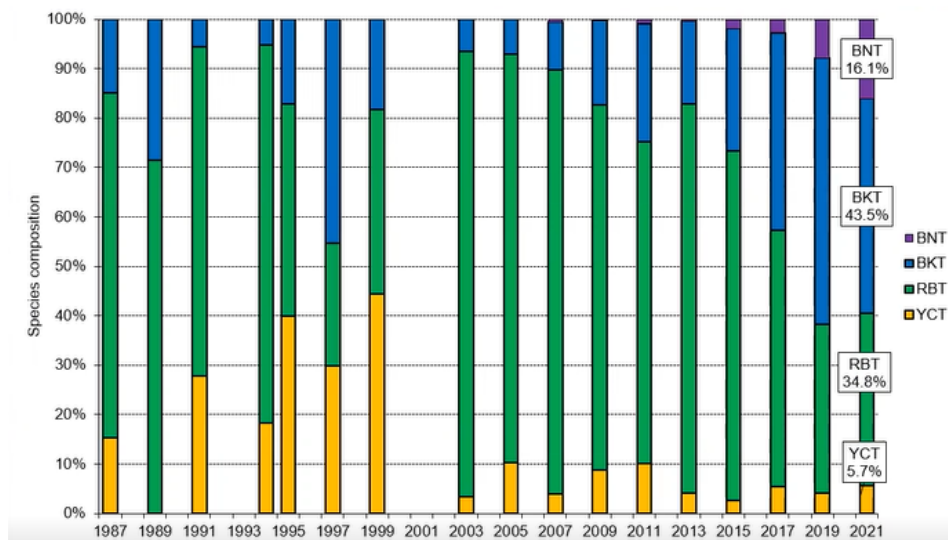


Figure 2. Abundance estimates and 95% confidence intervals from 1987 through 2021 for trout in the Breckenridge monitoring reach, Teton River. YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, BKT = Brook Trout, and BNT = Brown Trout.

 Jenn Vincent, IDFG

Friends of the Teton River is extremely concerned with the increase in Brown Trout in the Breckenridge reach. While population estimates have not yet been completed for BNT upstream of the Packsaddle Bridge it is known that BNT of all life stages are present downstream portion of the Teton River valley. When the increase in BNT is considered by species composition it is evident that the increase in BNT corresponds with the decrease in other trout species (IDFG 2021).



The above IDFG provided graph shows the species composition of trout at the Breckenridge Reach of the Teton River. Notice that the percentage of BNT in the reach has rapidly increased since 2013. In 2021 BNT comprised 16.1% of the trout in the Breckenridge reach. YCT are just 5.7% of the population

South Fork of the Teton

The South fork of the Teton survey reach begins near the Orange Bridge in Rexburg, ID. And ends near the confluence with the Henrys Fork of the Teton River. The reach is not often surveyed and has had only five surveys completed since 1993. In the 1993 survey population estimates were created only for Rainbow and Yellowstone Cutthroat trout. In the 2006 survey of the reach a population estimate was created for YCT, RBT and Brown Trout. Since 2006 BNT numbers have increased, while YCT and RBT numbers have been in decline. In the 2021 survey it was estimated that there are 84 BNT/mile, 19 YCT/mile and 7 RBT/mile (IDFG 2021). FTR does not have data that indicates BNT were detected before 2006.

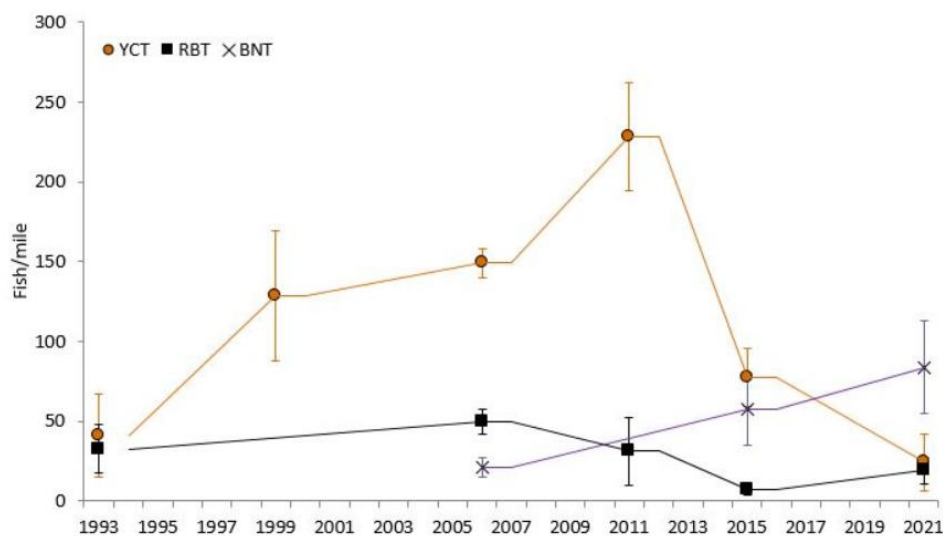
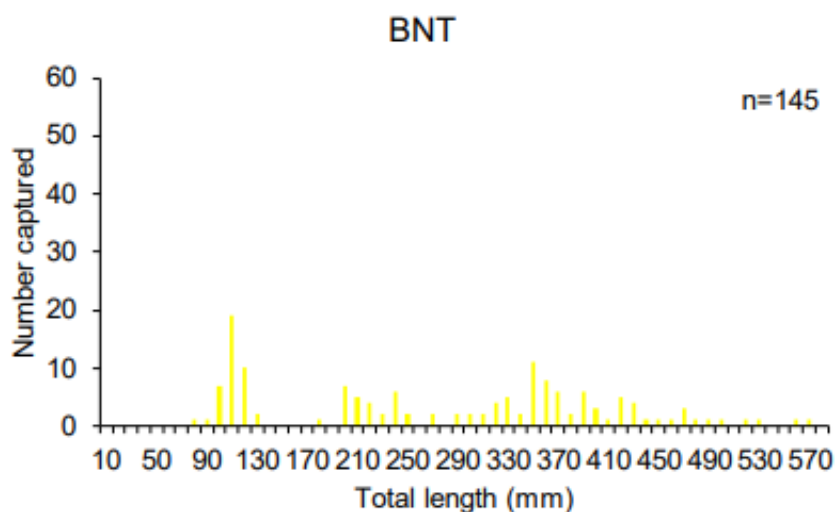


Figure 3. Abundance estimates and 95% confidence intervals from 1993 through 2021 for trout in the South Fork Teton River monitoring reach. YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, and BNT = Brown Trout.

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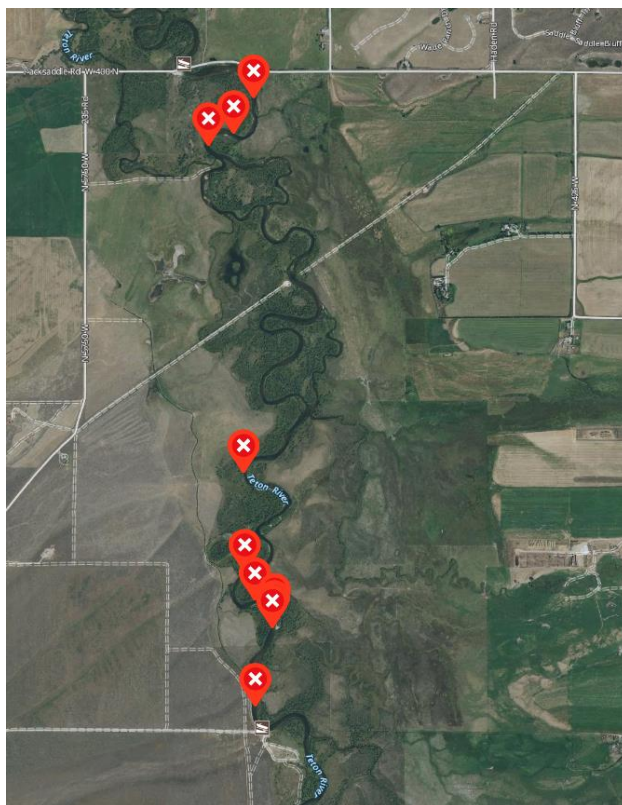
Brown Trout in the Teton

Brown Trout were first documented in the Upper Teton River by Idaho Fish and Game in 1987, and significant numbers of BNT were found during their 2007 population estimate survey of the Breckenridge reach of the Teton River. Since 2007 the number of BNT in the Teton has grown, especially in the Breckenridge reach of the Teton. Low numbers of BNT were found between 2007 and 2013 (Less than 7 fish per survey). Since 2013 BNT numbers have increased dramatically, with 28, 32, 145 in semi-annual surveys from 2015 through 2019. In 2019 the BNT population had grown abundant enough for IDFG to estimate 177 BNT/mile. In 2021 that estimate increased to 192 BNT/mile. When the BNT population is considered in relation to species composition by percentage the increase in BNT is extremely alarming as the proportion of BNT has approximately doubled every two years. In 2021 BNT comprise 16.1% of the population, far outnumbering YCT in that stretch of the river. Furthermore, BNT of all age classes were found during the survey, include many fingerlings. High relative weights (over 100) indicates that the species is successfully reproducing. BNT are not isolated to Breckenridge reach of the Teton as they have been found in upstream sections of the river. In the Buxton and Nickerson reaches of the Teton IDFG and found significantly fewer BNT but did find 5 fish in both the Buxton and Nickerson reaches.



The graph above, provided by IDFG, shows the length-frequency distribution for Brown Trout at the Breckenridge monitoring reach of the Teton River, 2019.

In October of 2021 FTR conducted a raft based redd survey between Rainey (Big Eddy) and the Packsaddle Bridge. During that survey FTR identified 16 BNT redds during that survey. This is the first time that fisheries scientists have identified BNT redds in Teton. FTR identified these redds as BNT redds due to the timing of the survey, and the characteristics of the redds. FTR was not able to conduct other BNT surveys that fall on the Teton but does believe that more surveys would result in finding more areas used by BNT to spawn. Locating these BNT redd's was a success for the Fisheries program, but also re-affirmed FTR's findings of BNT reproduction in the mainstem of the Teton. FTR plans to expand upon last years redd surveys by conducting raft based surveys from S. Bates through Harrops Bridge at a weekly frequency during the BNT spawning season.



The map above shows redds found during the 2021 survey of the Rainey (Big Eddy) to packsaddle bridge redd survey. No BNT were found on redds, yet redds matched BNT spawning characteristics in other watersheds.

Warm Creek Study

The Bronze Buffalo Club, Alder Environmental Consultants, IDFG and FTR have begun working collaboratively to investigate and a plan for the restoration of Warm Springs creek on behalf of Native YCT. The FTR fisheries program worked closely with IDFG study current habitat limitations, available spawning habitat and the current species composition of the creek. Our study started in the spring of 2021 when FTR and IDFG transplanted fluvial YCT from the mouth of Teton Creek to Warm Creek. Those YCT were kept in the system with a picket weir, spanning the creek and allowing no fish to move out the system. In April FTR and IDFG transplanted 16 fish and installed a weir. Unfortunately, the placement of the first weir allowed the weir to blow out, and for the transplanted fish to escape downstream. Three of the YCT that were transplanted in Warm Creek were detected three months later at our Teton Creek PIT tag interrogation site. The YCT that were detected at Teton Creek navigated more than 15 river miles, past irrigation diversions, through ponds and back to Teton Creek. After our failed attempt at stocking Warm Creek FTR and IDFG reinstalled the weir and translocated 12 fluvial YCT into Warm Creek. These YCT were transplanted into Warm Creek to investigate whether or not Warm Creek currently has suitable spawning habitat for YCT. FTR then conducted multiple redd surveys during the spring spawning season of 2021 and found no redds. Furthermore FTR found 8 of our transplanted YCT dead due to heron strikes or saprolegnia. This is a cause of mortality to YCT throughout our region during spawning season, but not at such a high proportion. This observation indicates that Warm creek requires habitat restoration before it can support abundant YCT spawning. Adding instream habitat, and overhead cover would result in a system that would support a healthy YCT population. A

restored Warm Creek would support a fluvial spawning population that travels from the Teton River to spawn in Warm Creek.

In late July IDFG and FTR followed up on previous survey efforts by electrofishing Warm Creek. The survey was conducted to inform FTR on the current species composition of Warm Creek. During the survey no YCT were observed, rather abundant RBT, EBT and 1 hybrid RBT X YCT were caught. Native long nosed dace, sculpin and suckers were found in the creek.

IDFG has begun to investigate the potential for a rotenone treatment of the creek, which kill all fish within the stream. This rotenone treatment would occur after restoration work on the stream was completed. If that treatment were to happen YCT eyed eggs and hatchery YCT or transplanted YCT would be stocked in the Warm Creek. It should be known that RBT and EBT exist in the upper Teton river and would likely re-invade Warm Creek if a fish passage barrier was not erected and maintained daily during the spawning season to allow for fluvial YCT to enter the system.

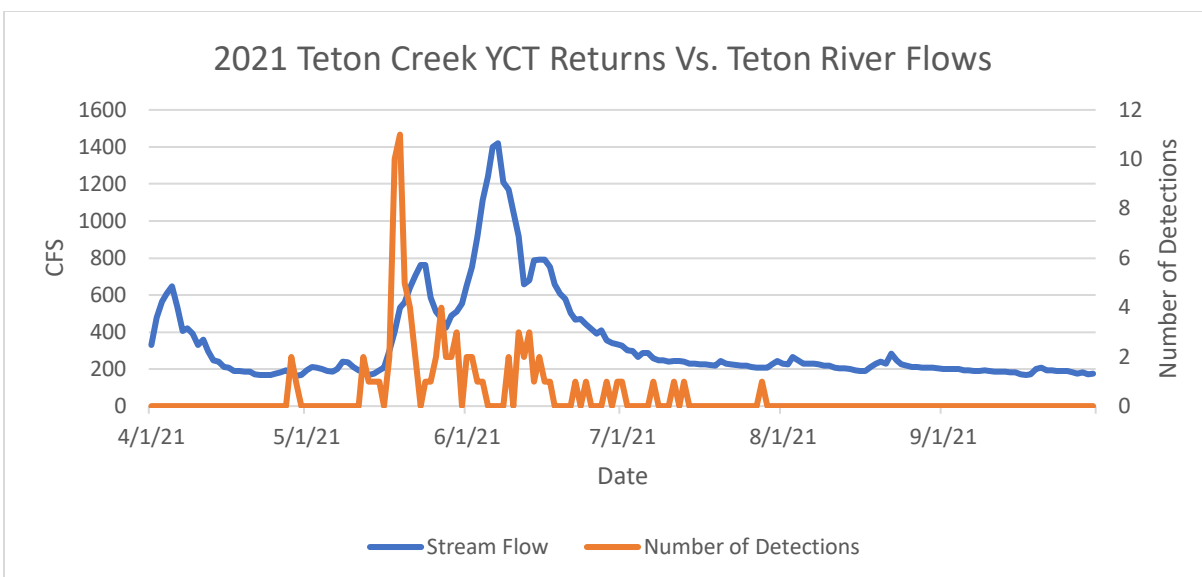
Passive Integrated Transponder (PIT) Interrogation sites

FTR has maintained PIT tag interrogation sites throughout the watershed since 2010. The sites are constructed using antennas that run across the stream channel. Those antennas detect any trout that has been tagged with a unique identifier. The identifying number is attributed to an individual trout, and when it passes through the antenna FTR can collect valuable life history data on that trout, such as when it moves upstream to spawn, and how many trout are using a tributary stream to reproduce, and how often individual trout return to the tributary. The sites are active in early April, for the beginning of the YCT spawning run. They remain active through October, to log other tagged species of interest including spawning Brook or Brown Trout that migrate in the fall. Over the last decade FTR, IDFG, and the Wyoming Game and Fish Department have tagged over 5,500 trout in the Teton River watershed. In 2021 FTR and IDFG tagged 471 fish, primarily during the IDFG's biannual electrofishing survey.



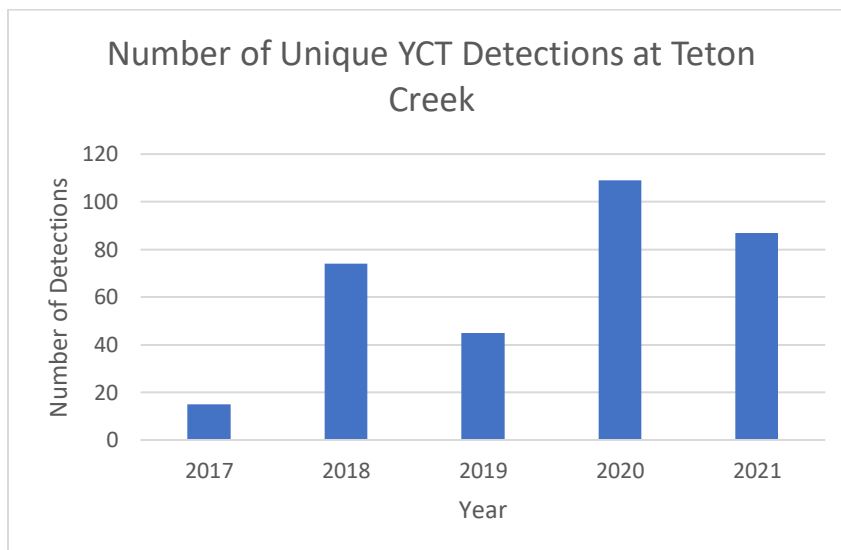
The above map shows FTR's active PIT tag interrogation sites in the Teton Valley. Also noted are sites that remained inactive in 2021.

Most of the spawning trout detected in the upper Teton River Watershed were detected at our lower Teton Creek PIT tag array. The most active dates for detections at Teton Creek were between May 12th and 22nd. Again in 2021 YCT movement is directly correlated with the ascending hydrograph, as the main pulse of fish moving upstream came just before the Teton river hydrograph peaked at 1,420 on June 7th. FTR's PIT tag detections have shown that year after year YCT are triggered to move upstream by the initial pulse in spring runoff, and that further movements of YCT will peak on the descending end of the hydrograph. Monitoring this relationship is imperative, as fisheries biologists believe that a late spring peak in the hydrograph separates spawning periods between RBT and YCT. RBT historically have begun spawning in mid-April, spawning that is triggered by increased sunlight and warming stream temperatures. FTR is concerned that climate change may lead to the hydrograph peaking earlier in the spring, creating more hybridization between RBT and YCT.



Lower Teton Creek (T1)

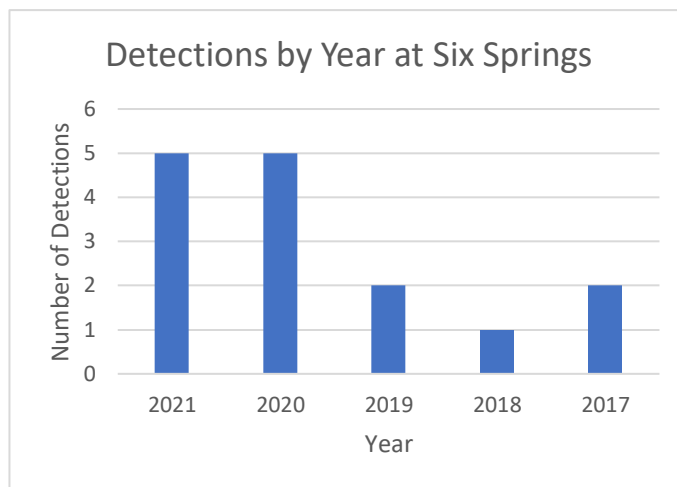
A total of 88 Spawning trout were detected at the lower Teton Creek interrogation site during the 2021 spawning season. The site is located 1 river mile upstream from the confluence with the Teton River. Trout detected there are likely to be moving upstream to spawn throughout the creek. FTR's research has found that Teton Creek is the most important spawning tributary to the Teton river. Of the fish detected, 80 were tagged in Nickerson reach of the Teton River. 1 fish tagged in the Breckenridge migrated to Teton Creek, and the remaining trout had been tagged at the mouth of Teton Creek. Of the fish detected only 5 were tagged prior to 2019 – all 5 were tagged during the 2017 survey of the Nickerson reach of the Teton River. 1 RBT was detected at the Teton Creek PIT tag site in 2021.



2021 was an active year at the Teton Creek Interrogation site. Major PIT tagging efforts in the Upper Teton have been in 2013, 2015, 2017, 2019 and 2021. Normally the highest returns are in the year after a tagging effort (2018, 2020) FTR is happy to see such a strong return of YCT in 2021.

Six Springs Creek

Five Yellowstone Cutthroat Trout were detected at the Six Springs interrogation site during the 2021 spawning run. Six Springs Creek is a small spring creek tributary to Teton Creek and is located on a Teton Regional Land Trust conservation easement south of Driggs. Four of the detected YCT were tagged in Nickerson reach of the Teton river, the fifth was tagged in the Breckenridge reach. Redd surveys conducted during the spring spawning season indicate that many more trout use the creek as a spawning tributary.



Fox Creek

Three Yellowstone Cutthroat Trout were detected at the Fox Creek interrogation site. Two of the trout detected were tagged in the Nickerson reach, and one at the Breckenridge reach of the Teton River. All of the trout detected during the 2021 survey were tagged during IDFG's 2019 surveys. No Rainbow, Hybrid or Brook Trout were detected during 2021. While that is good news, FTR will remain cautiously optimistic as many non-native trout were observed in Fox Creek during site visits in 2021. An increase in RBT at Fox Creek would inform FTR that spawning preferences or habitat characteristics have changed.

Canyon Creek

One trout was detected at the Canyon Creek interrogation site during 2021. Unfortunately, the tag number is not in our database. It was found that fish passage was blocked down stream of our PIT tag site due to equipment malfunction. FTR will ensure that fish passage is open during 2022 and hopes to find trout moving upstream.

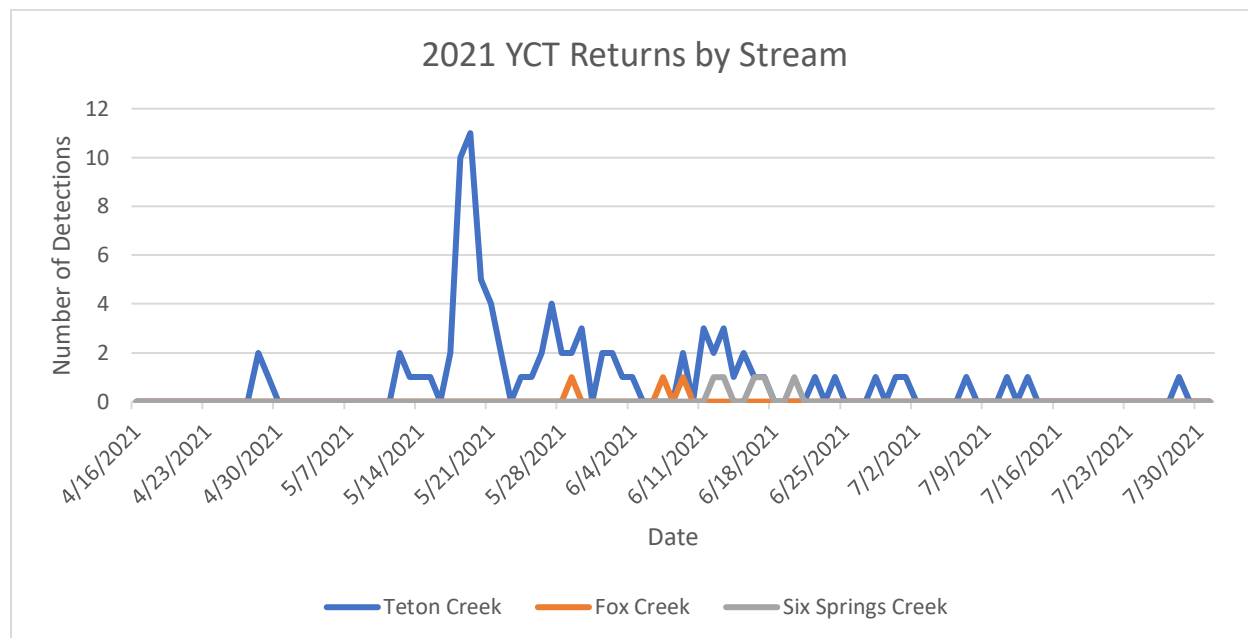
Upper Teton Creek (T2) and Upper Bitch Creek

The PIT tag interrogation site on upper Teton Creek in Alta, WY. operated for only a short time during the 2021 field season. The Upper Bitch Creek site did not operate in 2021. The two sites had been long troubled due to many years of high runoff impacting our antenna. Thanks to grant funding provided by the Teton (WY) Conservation District FTR was able to redesign and rebuild the PIT tag site on upper Teton Creek. By working with leaders in PIT tag design FTR has updated our monitoring site, and are looking forward to a productive year of monitoring during 2022.



Lower Bitch Creek

The Lower Bitch Creek PIT tag site was not operational during the summer of 2021. FTR plans to use lessons learned and designs from our new systems are T2 and Upper Bitch Creek to rebuild the site during the fall of 2022.



Teton Creek had far more returns than all other PIT tag monitoring sites. The graph above shows unique YCT detections by date at our three most active sites. Note the delay between returns at Teton Creek and the timing of YCT passing through the Six Springs site.

Redd Surveys

During the spring of 2021, FTR monitored creeks throughout the watershed on behalf of our redd survey program. A redd survey is completed by walking along a stream that is believed to be YCT spawning habitat. Locations of spawning YCT can be identified by the “clean” gravel beds that are created when YCT reproduce. FTR continued to monitor long established sites in the Six Springs Creek sub-watershed and on Lew’s Spring Creek. Both creeks are tributaries to Teton Creek, one of the most important spawning tributaries to the Teton River. Numbers of spawning trout in the Six Springs system were high, indicating a strong spawning run. We monitored redd survey sites on Headwaters Spring Creek (at the southernmost end of Teton Valley), Canyon, and Calamity Creeks. Conducting redd surveys allows FTR to monitor for changes in numbers of spawning trout, a key indicator of population health.

Six Springs: During the spring of 2021, FTR conducted four redd surveys on Six Springs Creek, and the spring fed system on the property managed by the Teton Regional Land Trust. The first survey was conducted on June 10th, and the last was completed on July 15th. The first redd was detected on June 10. Thirty YCT spawning redds were detected. The majority of the redds observed in Six Springs creek were found on June 24th. No redds were observed on the small tributary creeks to Six Springs Creek, despite being surveyed on every visit to the Six Springs system. Surveys conducted during 2021 were along the length of the Six Springs system. FTR is encouraged by the spawning observed in Six Springs Creek. YCT have clearly responded well to the restoration efforts along the system, and uses a Six Springs as a model for habitat restoration throughout the watershed.

Stream Name	2021	2020	2019	2018
Six Springs Creek	30	26	9	28

Lew’s Spring Creek: During the spring spawning season of 2021, FTR visited Lew’s Spring Creek three times to conduct YCT spawning redd surveys. Lew’s Spring Creek is a small spring fed stream that flows into Teton Creek, just before its confluence with the Teton River. Our first visit to the site was on 6/15/2021. The only redd observed during 2021 surveys was found on 6/15/2021. During that survey a large Yellowstone Cutthroat Trout was observed.

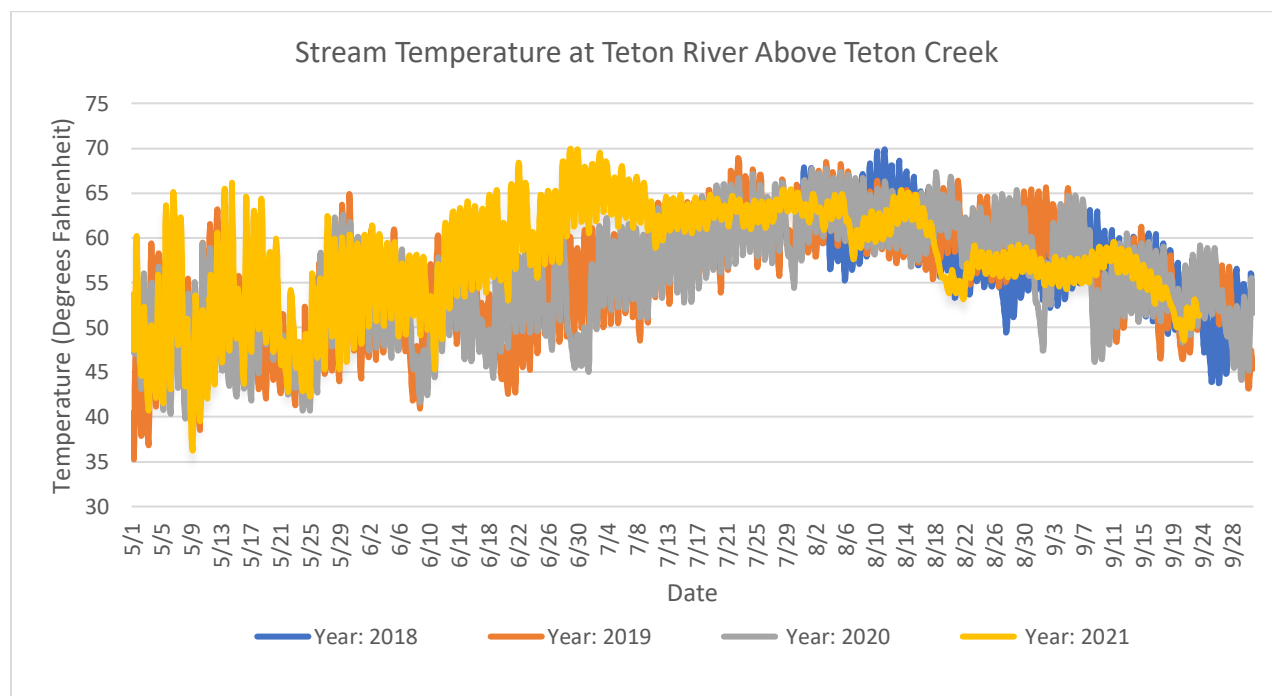
Headwaters Spring Creek: In the spring of 2020, FTR established a survey site on Headwaters Spring Creek. The creek is spring fed creek that adds a substantial amount of flow to the upper Teton River. During our second year of redd surveys on the creek FTR did not observe any redds. We will continue to study the stream, as it has the characteristics of valuable spawning habitat, yet is surrounded by degraded habitat.

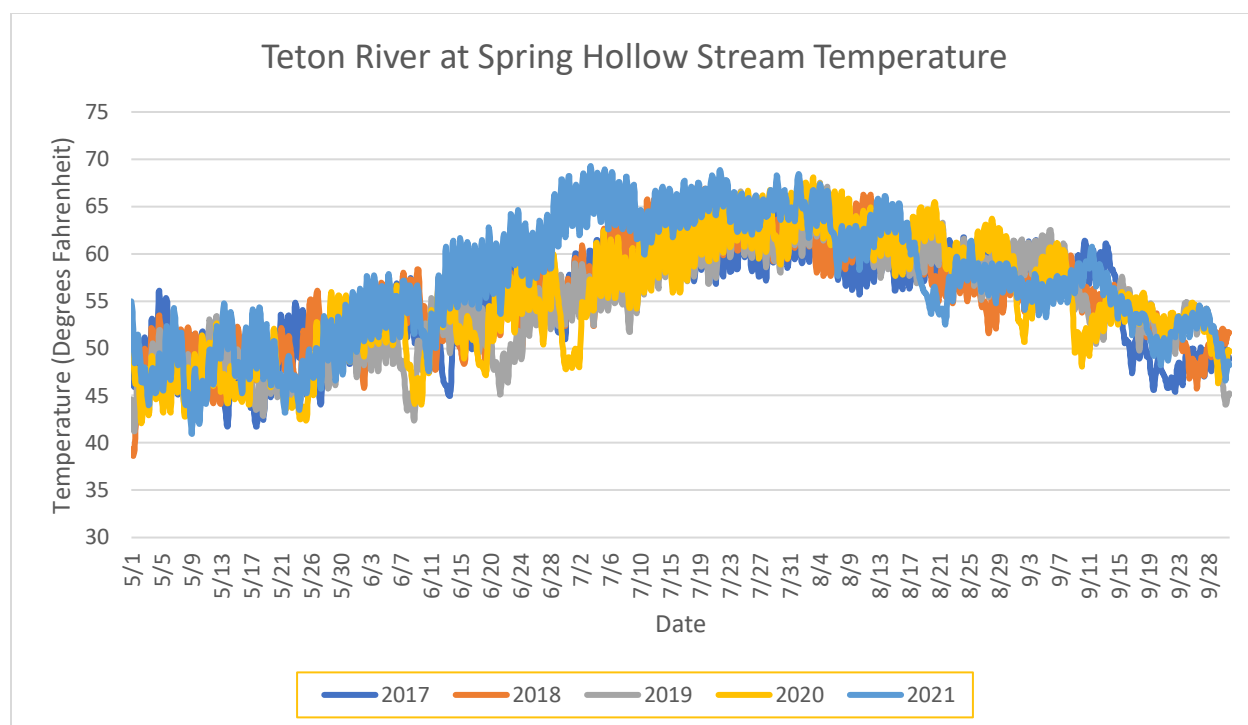
Canyon Creek: Over the last ten years, FTR restoration efforts have led to increasing numbers of YCT in Canyon and Calamity Creeks. To better understand how YCT are responding to restoration efforts, FTR has established a 1-Kilometer-long site on upper Canyon Creek. The site was first established in 2004, but FTR had not regularly visited the site since. During three visits to the newly established site, no YCT spawning redds were observed, however the stream reach was observed to be excellent potential spawning habitat.

Calamity Creek: Calamity Creek is a small tributary to upper Canyon Creek. FTR first surveyed Calamity creek in 2004, but has since not regularly returned to the stream. Recent restoration efforts necessitated that FTR establish a 1-kilometer-long survey site. No redds were found in Calamity creek this year. The lack of redds may be attributed to fish passage being blocked in lower Canyon Creek. FTR will ensure that passage is possible past all points of diversion on Canyon creek and monitor for migrating trout.

Temperature Monitoring

Beginning in 2011, FTR started installing remote temperature loggers throughout the Teton River Watershed. During the fall of 2021, FTR collected temperature data at the 36 temperature loggers currently maintained in the watershed. These loggers are placed in all of the major tributaries to the Teton River, along the length of the upper Teton River, and in the Teton River Canyon. By monitoring water temperature, FTR can actively assess impacts on stream conditions and the fishery. Native Yellowstone Cutthroat Trout require clean, cold water, thus having a robust database of historic stream temperature allows FTR to identify specific temperature changes. The strategic placement of the temperature loggers upstream and downstream of the confluence of tributary streams and the Teton River allow FTR to detect the influence of water flowing in from the tributary streams. FTR also has an on going groundwater recharge monitoring program, that can potentially impact stream temperature and discharge. FTR's temperature data is shared with agency partners. Stream temperatures are compiled by the US Forest Service on this [NorWest](#) interactive map.





In the foreground of both graphs you can see 2021 stream temperatures in the upper and canyon sections of the Teton River. At both sites stream temperatures were substantially higher during June and early July than past years. FTR did not document impacts to the fishery due to temperature during 2021, but will monitor for impacts to recruitment.

Conclusion

The Friends of the Teton River Fisheries and Field Monitoring Program had a successful year of field monitoring and capacity building. Our field monitoring efforts contribute to agency partners decision making about fisheries and ecosystem management. FTR also relies on our monitoring efforts to track the impacts of our restoration and groundwater recharge programs. FTR has expanded its capacity by hiring a Fisheries Program Manager to implement monitoring programs and evaluate data, adding to the organization's capacity for this work (prior to this, FTR hired seasonal technicians to maintain data sets). FTR will continue to collect data relevant to the fishery throughout the watershed at established redd survey locations, temperature, and interrogation sites in 2022. During the 2022 field season FTR will be expanding our scope of work to include a non-native Brown Trout monitoring program. Look out for our annual water quality monitoring report, which will include detailed water temperature data.

Please reach out to Max Lewis with any questions about FTR's work.

max@tetonwater.org.

Vincent, J., 2021 "Teton River 2021 Summary" Published online on behalf of Idaho Fish and Game.