Summary of Findings of the Joint Fisheries Investigation for the Delaware Tailwaters

2018-2020

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SUMMARY OF FINDINGS OF THE JOINT FISHERIES INVESTIGATION FOR THE DELAWARE TAILWATERS 2018-2020

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Cover photos (clockwise from top left): trout anglers on the West Branch Delaware River -S. Wells, PIT tagging a brown trout -F. Henson, Nighttime electrofishing -T. Pokorny, Large brown trout -T. Pokorny

Introduction

Water released from Pepacton Reservoir into the East Branch Delaware River (East Branch) and from the Cannonsville Reservoir into the West Branch Delaware River (West Branch) supports a nationally renowned tailwater sport fishery for wild trout (Figure 1). Significant changes, notably improvements to seasonal flow regimes, have occurred in the Delaware tailwaters over the last two decades. In 2017, stakeholders voiced concerns that increased fishing pressure and harvest were causing negative impacts to the wild trout population. However, the information available to resource managers was too outdated to evaluate the concerns.

Given the value of this resource, the Pennsylvania Fish and Boat Commission (PFBC) and the New York State Department of Environmental Conservation (NYSDEC), collaboratively designed and implemented a three-year study[1] in 2018 to collect biological and social data to assess the status of the fishery and create a new baseline of information for future management. The following narrative provides a concise summary of what was learned about the wild trout population and the fishery it supports. While the focus of the study was on the West Branch and tributaries described in the Joint Investigation Fisheries Plan, angler use information was also obtained for portions of the East Branch and the mainstem Delaware River. Data collected outside of the 2018-2020 study timeframe, but using the same methods, are included in analyses when relevant.

Status of the Wild Trout Population

Brown Trout

From 2017 to 2021, the brown trout population in the West Branch was abundant and stable. This is evident in the modest annual variation in relative abundance of young-of-year (YOY) (Figure 2) and yearling and older trout (Figure 3). The electrofishing catch rate for yearling and older trout generally exceeded 170 trout/hour. The electrofishing catches also confirmed that the West Branch population exceeded the NYSDEC's abundance benchmark of 500 yearling and older trout per mile for the *Wild-Premier* management category.[2]

While peaks consistent with especially strong recruitment years are apparent in the length frequency histograms for yearling and older trout (Figure 4), the consistent prevalence of trout in the 12-to-18-inch size range is noteworthy evidence of dependable growth and recruitment of yearlings to the older year classes preferred by anglers. In every year except 2019, trout in the

[1] Joint Fisheries Investigation Plan (JFIP)

[2] New York State Trout Stream Management Plan

12-to-18-inch size range exceeded 50% of the total electrofishing catch. Consistent with typical inland trout streams in New York and Pennsylvania, trout greater than 20 inches made up less than 5% of the electrofishing catch in any given year.

Redd count data and YOY abundance observations suggest that both tributary and mainstem habitats are important to brown trout reproduction and recruitment. While the proportions of tributary versus mainstem origin recruits could not be quantified in this study, the broad dispersal of reproductive activity likely contributes to the observed resilience of brown trout recruitment. In comparison with historic redd count data, this study documented a large spatial expansion of spawning activity within the West Branch. Redds were found in greater numbers, and over a larger area of the river, than previously observed. The highest concentration of redds consistently occurred in the uppermost reaches of the West Branch and East Branch tailwaters. The PIT tag detection antennae deployed to detect tagged trout migrating to and from tributaries proved to be unreliable during episodic high flow events when trout are mostly likely to enter or exit. Trout detections were minimal, suggesting that brown trout recruitment may be less tributary dependent than was assumed prior to the investigation. However, given the unanticipated limitations of the detection technology, the importance of tributary spawning should not be discounted.

Despite the poor performance of the detection arrays, the PIT tags themselves proved to be an effective method for marking individual trout and providing reliable recapture data over multiple years. The ability to reliably identify previously captured individuals was important to the success of the investigation. Within the West Branch, trout movement was limited, with 97% of recaptures occurring at the same sampling location as the original capture. In this study, age determination from scales was attempted because a non-lethal method was desired. Unfortunately, recapture data demonstrated that scale-based age determinations routinely underestimated the ages of older trout of greatest importance to the fishery. If reliable age data are deemed essential for management, then alternative aging methods must be employed.

Rainbow Trout

Rainbow trout are a much smaller component of the West Branch trout population than brown trout. The total electrofishing catch of yearling and older rainbow trout from 2017 to 2021 was 749 compared to 8,641 yearling and older brown trout. Electrofishing catch rates were less than 26 rainbow trout/hour throughout the study (Figure 3). While the average catch rate was more variable from year to year compared to brown trout, the differences were not statistically significant. So relative abundance can best be characterized as low but stable.

Despite the low relative abundance of yearling and older rainbow trout, the size structure of the population demonstrates a stable pattern of recruitment and growth like that of brown trout (Figure 4). In all years, trout in the 12-to-18-inch size range made up over 47% of the total catch. However, the West Branch rainbow trout population does not include the maximum sizes seen with brown trout. Rainbow trout over 18 inches never exceeded 10% of the total catch and individuals over 20 inches were rarely observed.

Compared to brown trout, rainbow trout YOY were far less prevalent in the West Branch itself. The highest catch rates were associated with sampling sites in tributaries or near tributary confluences. Within these habitats, the highest catch rates were associated with the most downriver tributaries. Specifically, Balls Creek, Shehawken Creek, and Sands Creek appear to be the most important contributors to rainbow trout recruitment to the West Branch. High flow conditions precluded the springtime redd counts envisioned in the study plan. Therefore, in contrast to the information gained on brown trout spawning activity, the extent of rainbow trout redds in the West Branch could not be directly assessed. Nonetheless, the observed spatial patterns of YOY abundance suggest that, compared to brown trout, rainbow trout reproduction is far more dependent on tributaries to the lower reaches of the West Branch.

Status of the Recreational Fishery

Fishing Pressure

Fishing pressure estimates from two years of creel survey (2018-2019), validated the perception that angler use has increased substantially since the 1990's for the Delaware tailwaters in general and the West Branch specifically (Figure 5). An estimated 49,901 trips and 66,814 trips occurred with anglers spending a total of 250,278 and 311,089 hours fishing from April through mid-October in 2018 and 2019, respectively. The intensity of fishing pressure on the West Branch, 276 and 326 angler hours/acre, is remarkably high compared to recent intensity estimates on other prominent, high quality, wild trout streams in New York and Pennsylvania.[3] Estimates of intensity for the East Branch, 112 and 110 angler hours/acre, and Delaware River, 22 and 55 angler hours/acre, are more typical of other high quality, wild trout streams.

The increased fishing pressure is largely attributable to anglers whose fishing trips encompassed at least two reaches of the Delaware tailwaters as defined in the creel survey methods. Termed "movers", these anglers fished 94,367 hours during the 2018 season and 80,407 hours in 2019 (38% and 26% of the respective totals). In contrast, this component of the fishery was considered negligeable and not specifically quantified in the 1990's creel surveys. Considering that higher summer flows are more favorable to float trips, the increased

[3] Clear Creek, NY -200 angler hours/acre estimated (September 2019-August 2020);

Lime Lake Outlet, NY -49 angler hours/acre estimated (September 2019-August 2020);

Esopus Creek, NY -87 angler hours/acre estimated in 2022 (April-December);

Bald Eagle Creek, PA -157 angler hours/acre estimated in 2022 (April-August);

Penns Creek, PA -181 angler hours/acre estimated in 2019 (April-August)

prevalence of a “mover” fishing strategy since implementation of the Flexible Flow Management Program (FFMP)[4] is unsurprising.

The creel survey results support several additional conclusions regarding the distribution of fishing pressure in the Delaware tailwaters. Wade fishing remains the most common fishing tactic accounting for 59% of angler interviews in 2018 and 66% of 2019 interviews. Approximately one third of the fishing pressure is attributable to boat angling. The majority of fishing pressure occurred between 10:00 AM and 5:00 PM with a daily peak at approximately 1:30 PM. Seasonally, fishing pressure peaks in May but remains high through the summer and early fall.

Catch and Harvest

The angler catch and harvest rates calculated from the creel survey data reflect a fishery in which trout are challenging to catch and in which the trout that are caught are seldom harvested. Like the electrofishing catch results previously discussed, they are inconsistent with the premise of a fishery in decline. Estimated total catches were 103,696 and 169,077 brown trout and 23,162 and 23,563 rainbow trout in the Delaware tailwaters during the 2018 and 2019 surveys, respectively. It is not possible to quantify the extent to which individual trout caught multiple times contribute to the total catch, but the frequent observation of healed hook-scar tissue in the mouths of trout handled during the study suggest that “recycling” is occurring. Concurrently, about two thirds of interviewed anglers caught no brown trout during their fishing trips while 85% of anglers caught no rainbow trout. While the size distribution of the angler catch approximates the size distribution of trout sampled in the river by electrofishing, particularly for brown trout (Figure 6), angler catch rates are not an informative index of abundance. Finally, the catch data reveal that the catch is widely dispersed among participating anglers. Most of the total catch is attributable to anglers who caught two trout or less during their trips.

The fishery is dominated by voluntary catch-and-release behavior, with over 94% of the total catch released. Anglers harvested 3,819 (4% of total catch) and 10,745 (6% of total catch) brown trout and 469 (2% of total catch) and 85 (0.3% of total catch) rainbow trout for the 2018 and 2019 surveys, respectively. This level of harvest does not appear to be detrimentally impacting either population (Figure 6).

[4] Flexible Flow Management Program (FFMP 2017)

Angler Characteristics

Angler responses to demographic and opinion questions included in the angler interviews were generally consistent with expectations for a destination sport fishery. Twenty-five percent of angler participation during both the 2018 and 2019 seasons originated from the New York City metropolitan area. In contrast, anglers providing residential zip codes adjoining the Delaware tailwaters were encountered infrequently, and local participation ranged from 7 to 8%. Most anglers were from the states of New York 44 – 55%, Pennsylvania 19 – 20 %, and New Jersey 5 – 6%, annually. However, anglers from 39 states were interviewed in 2018 with 36 states represented in the 2019 interviews. Approximately 10% of interviewed anglers stated that their trip was guided, with the majority of self-identified guides providing business zip codes from the New York City and Wilks-Barre-Scranton metropolitan areas. Most anglers reported high trip satisfaction (76.3% in 2018 and 70.7% in 2019) despite the low catch and harvest rates. Only 3% of anglers identified harvest as important for a satisfactory trip. In 2018 and 2019, catching many trout was important to 27 to 32% of anglers, catching large trout (greater than 18 inches) was important to 27 to 37%, and catching trout 20 inches or larger was important to 26% of anglers.

Conclusion

Throughout this investigation, reservoir releases largely succeeded in meeting the habitat protection objectives for the West Branch outlined in the 2017 FFMP. Consequently, water temperatures rarely exceeded the accepted optima for brown and rainbow trout (Figure 7). Under these environmental conditions, the wild trout population of the West Branch has been healthy and stable despite the intense angler use that it has attracted. Current fishing pressure is substantially higher than was estimated in the 1990's. However, the results of this study provide reassurance that the trout population is not in decline. The Delaware tailwaters supports a quality wild brown trout and rainbow trout fishery and can be best described as a destination fishery that receives high angler use, with a vast majority of anglers voluntarily releasing their catch. Angler satisfaction is high, despite low catch rates, which is likely driven by the anticipation of catching a large trout.

Next Steps

Although this study did not answer all relevant management questions pertaining to the Delaware tailwaters trout fishery, it did produce the new baseline of information sought by fisheries managers and stakeholders. Next, the lessons learned will be used to write a pragmatic fisheries management plan that will identify and prioritize additional information needs. Finally, the plan will focus on adaptive strategies to maintain the acclaimed quality of the wild trout fishery and to detect and address emerging concerns.

Figures

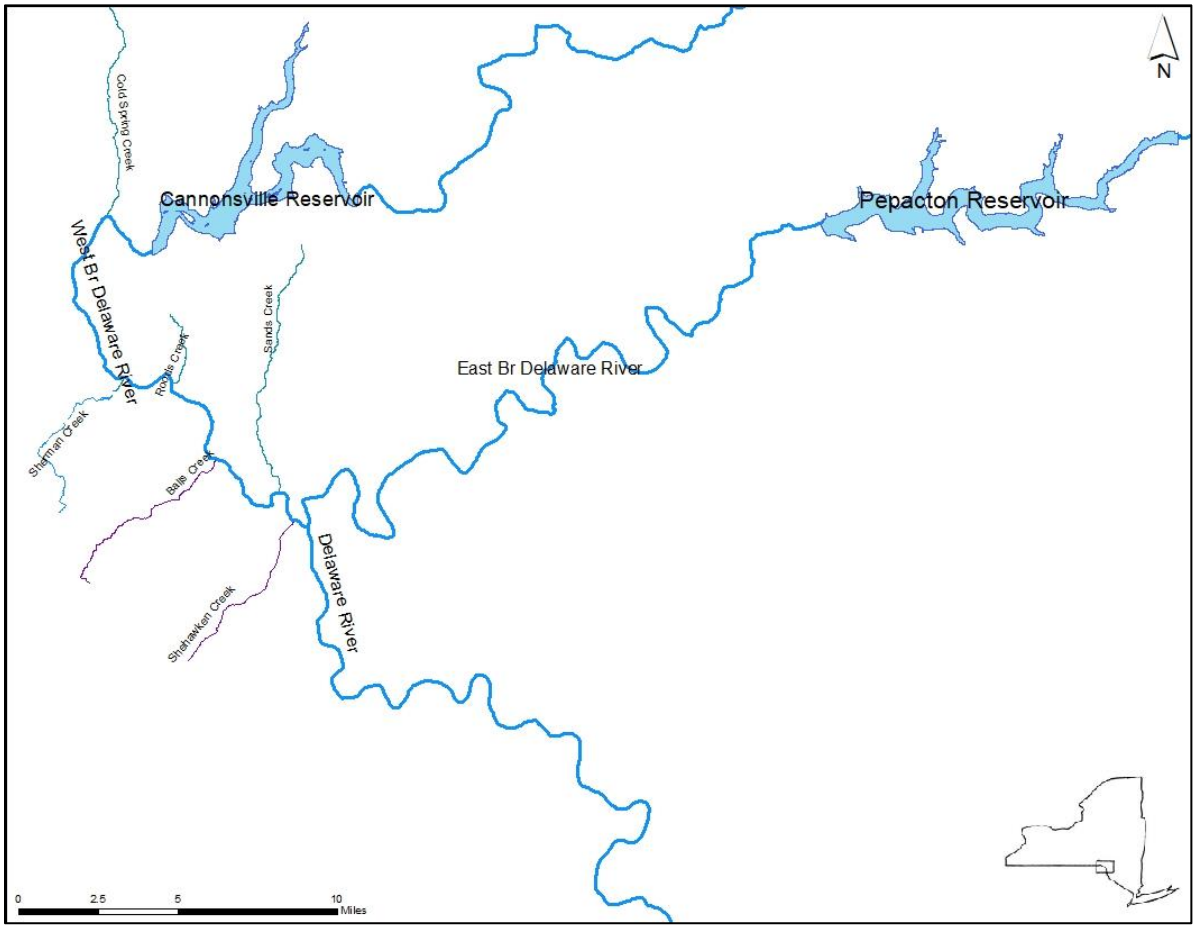

Figure 1. The Delaware Tailwaters: West Branch, East Branch, Main Stem and selected tributaries.

Figure 2. Annual arithmetic mean and associated 95% confidence intervals for young-of-the-year brown trout and rainbow trout collected from five West Branch sampling locations and ten sampling locations on tributaries to the West Branch, 2017 to 2020.

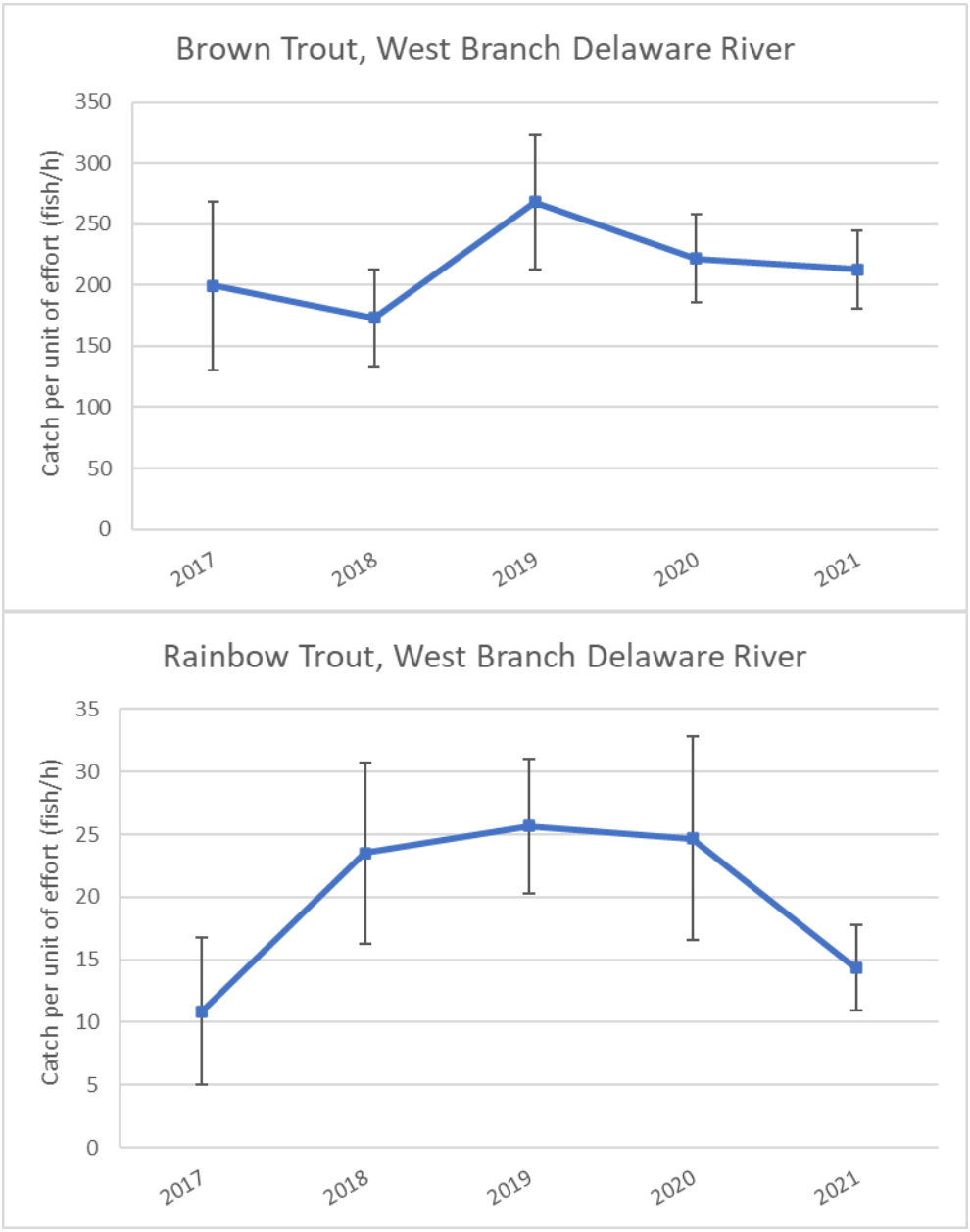

Figure 3. Estimated annual relative abundance (fish/h) for yearling to adult sized brown trout and rainbow trout represented as the annual arithmetic mean and associated 95% confidence intervals from the nighttime boat electrofishing in the West Branch, 2017 to 2021.

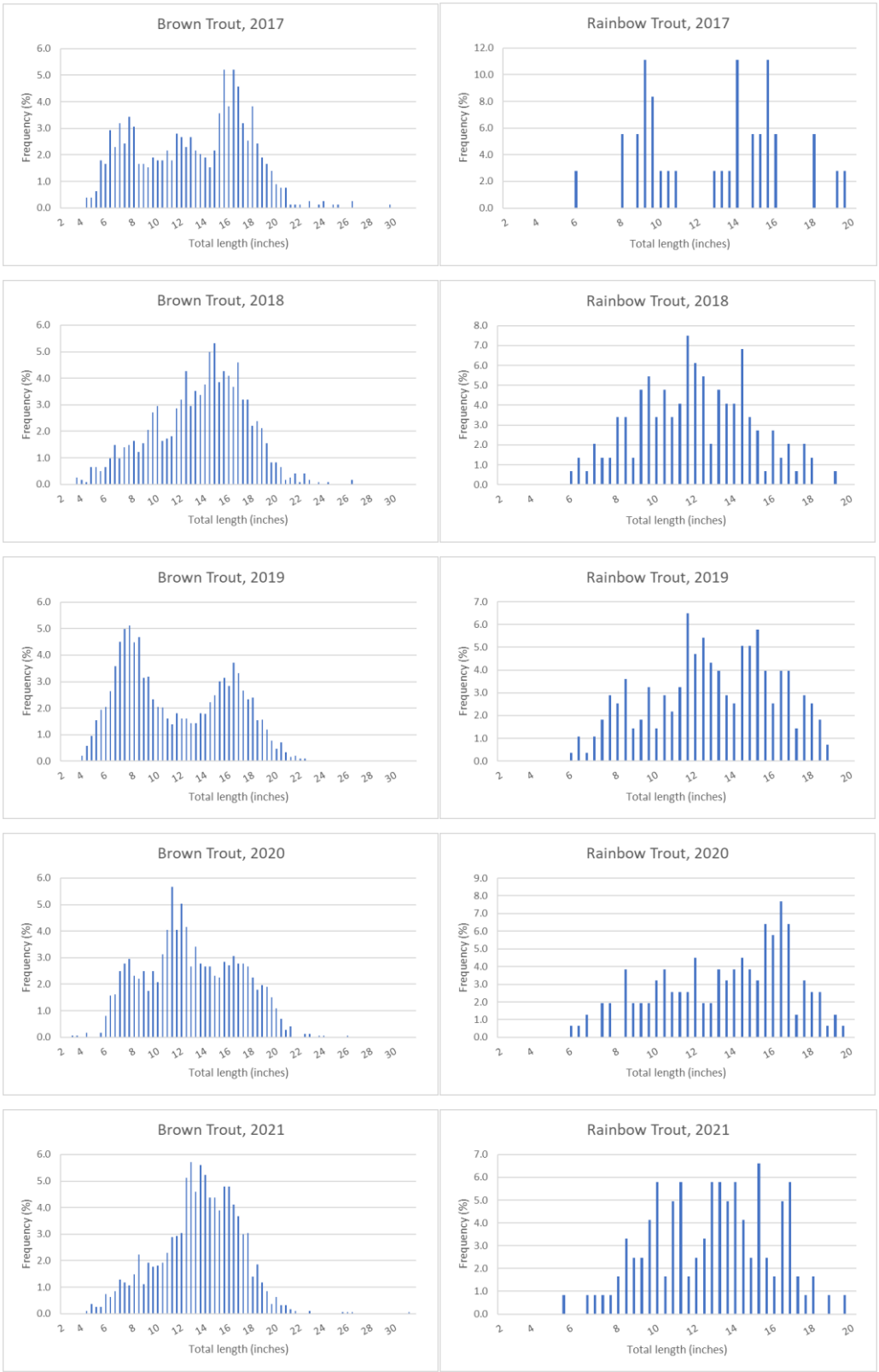

Figure 4. Size distribution of brown trout and rainbow trout captured from the nighttime boat electrofishing in the West Branch, 2017 to 2021.

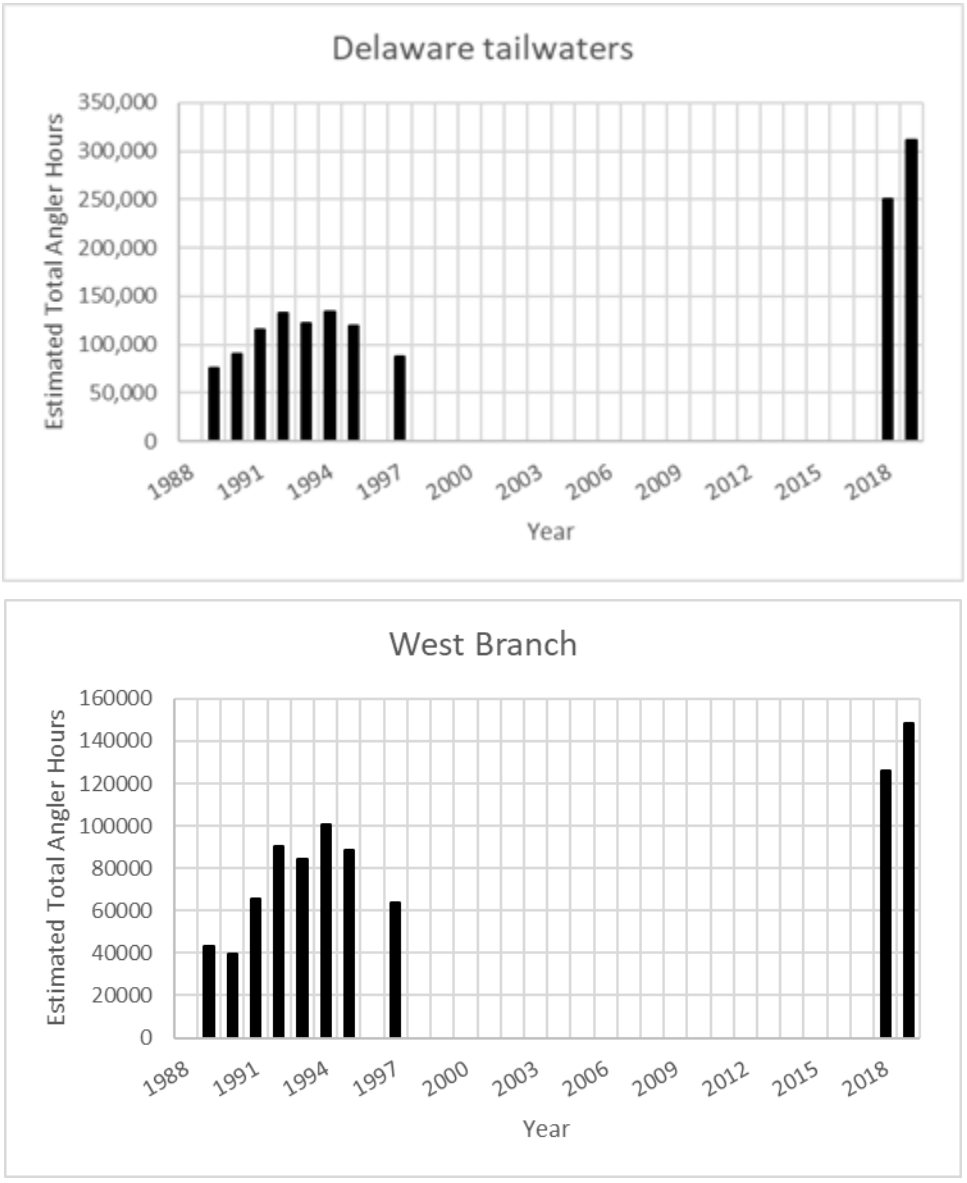

Figure 5. Estimated angler hours (N) within the Delaware tailwaters and the West Branch for 2018 and 2019 survey years compared to historical estimations from the 1990's Delaware tailwaters fishery.

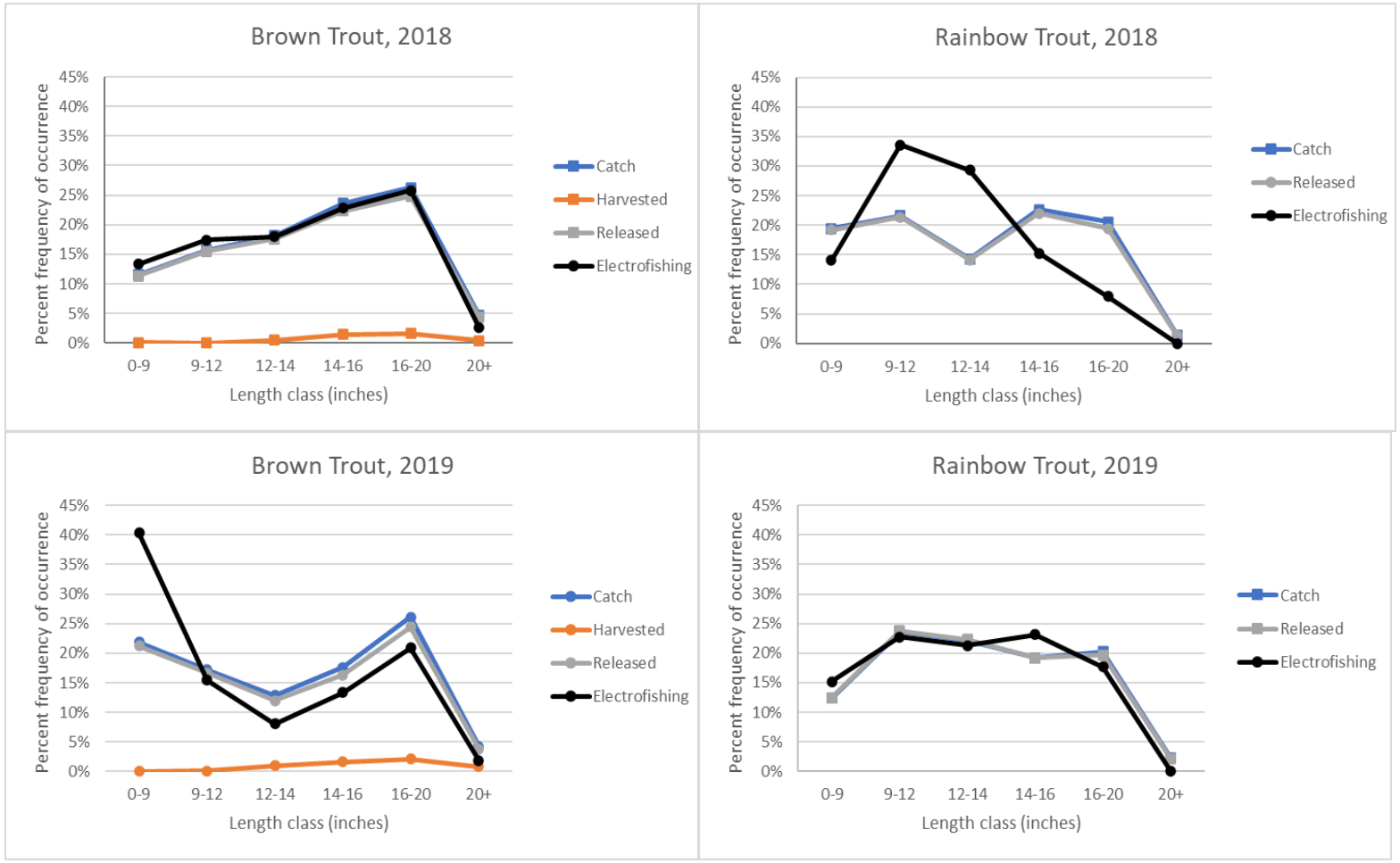

Figure 6. Length class distribution (inches) of brown trout and rainbow trout for released (gray line), harvested (orange line) and total catch (blue line) for the estimated total catch from the Delaware tailwaters (i.e., East and West branches and Delaware River, combined). Length distributions were not generated for harvested rainbow trout due to the exceptionally limited (< 10) number of reported harvested from interviewed anglers. Length distribution for observed catch from electrofishing surveys (black line) are illustrated for comparison to angler catch distributions.

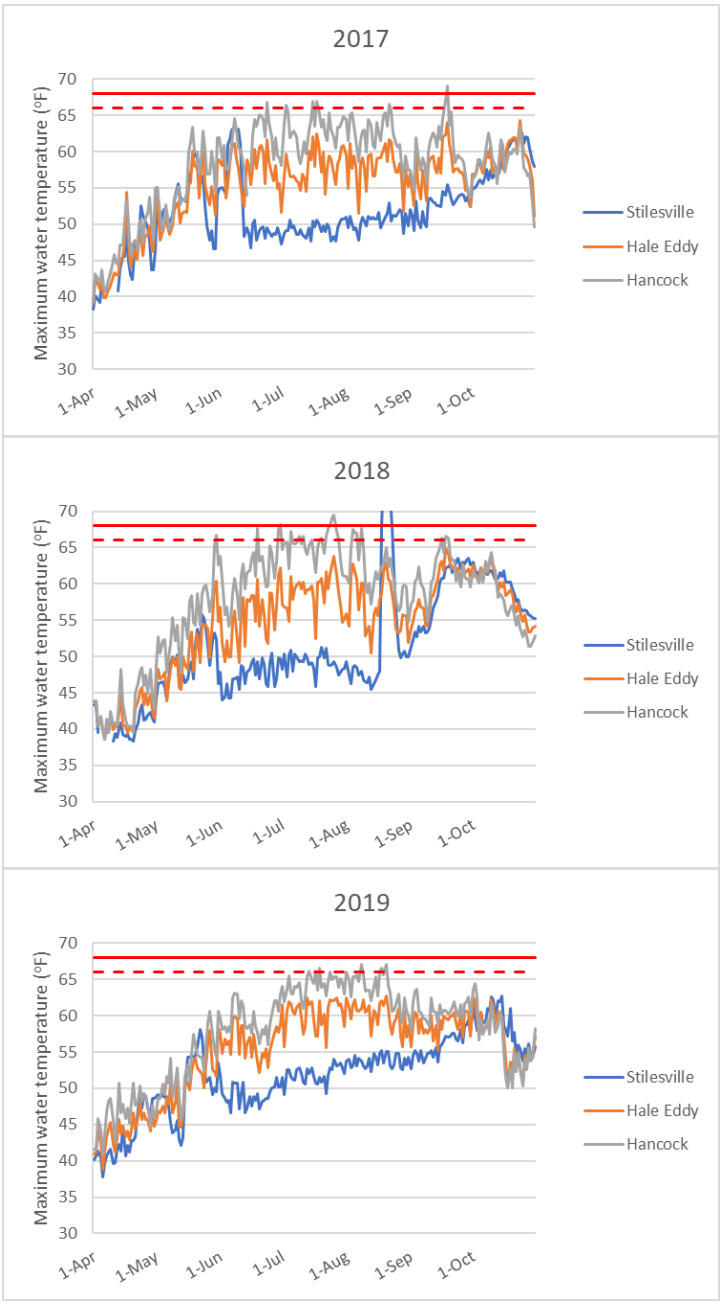

Figure 7. Observed daily maximum water temperatures (°F) as recorded at the U. S. Geological Survey, Stilesville (RM 16.6), Hale Eddy (RM 9.0), and Hancock (RM 1.3) gage stations, for the West Branch, April 1 to October 31, 2017 to 2021. The horizontal red lines represent maximum optimum water temperatures for YOY (dashed) and adult (solid) brown trout and rainbow trout.

Figure 7. Continued.