South Holston Tailwater Trout Fishery Management Plan 2022-2027

Tennessee Wildlife Resources Agency

February 2022

South Holston Tailwater Trout Fishery Management Plan 2022-2027

Prepared by

Jim W. Habera, Sally J. Petre, Bart D. Carter, and Carl Williams
Tennessee Wildlife Resources Agency

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FOREWORD

Meeting Tennessee's variety of trout management challenges requires that the Tennessee Wildlife Resources Agency (TWRA) have a comprehensive management plan capable of addressing current needs, while also anticipating areas where future needs may arise. The Statewide Trout Management Plan (STMP) provides guidance for the management of Tennessee's trout fisheries given the status of wild trout resources and hatchery trout production (TWRA 2017). The South Holston Tailwater Management Plan provides goals, strategies, and objectives for managing the trout fishery in this tailwater in accordance with the Mission Statement of the STMP. Other relevant goals, objectives, and strategies of the 2017-2027 STMP supported by this management plan are provided in the appendix and the entire STMP can be viewed at https://www.tn.gov/content/dam/tn/twra/documents/Tennessee-Trout-Management-Plan-2017-2027.pdf.

MANAGEMENT GOAL: *Continue providing a high-quality, largely self-sustaining trout fishery which provides a variety of angling opportunities.*

Quality trout angling in tailwaters includes opportunities to experience high catch rates, to catch larger fish (i.e., ≥16 inches), and to catch wild fish, thus management strategies will continue to focus on these outcomes. This basic goal was developed with public input (including a public meeting in 1999) and was incorporated in all subsequent management plans (Habera et al. 2003, 2009, 2015). It remains relevant as 90% of South Holston tailwater anglers interviewed during the most recent (2019) creel survey (n=466) rated TWRA's management of the trout fishery as 'excellent' (Habera et al. 2020a).

STRATEGIES:

- *Feature the exceptional wild Brown Trout* Salmo trutta *and developing wild Rainbow Trout* Oncorhynchus mykiss *fisheries*
- *Provide a supplemental hatchery-supported fishery for adult Rainbow Trout*
- *Maintain the 16-22-inch protected length range (PLR) or "slot limit" regulation for all trout established in 2000*

Nearly all South Holston tailwater anglers surveyed in 2019 (90%; Habera et al. 2020a) also continued to support the 16-22-inch PLR regulation, thus it will remain in effect. However, the PLR currently has limited potential for producing higher abundances of 16-22-inch trout (as determined by annual monitoring) or for improving the relative stock density of trout 16 inches and over (RSD-16). Angling regulations will continue to include a daily creel limit of 7 trout, one of which may exceed 22 inches, and no bait restrictions.

1. BACKGROUND

The South Holston tailwater extends ~22.5 km (13.7 mi.) from South Holston Dam to Boone Reservoir. The tailwater was created in 1951 when Tennessee Valley Authority (TVA) completed construction of the dam at South Fork Holston River Mile (SFHRM) 49.8 in Sullivan County, Tennessee. The reservoir upstream of the dam has a drainage area of 1,821 km^2 (703 $mi.^2$) and extends upstream for 38.1 km (23.7 mi.) into Washington County, Virginia. Much of the watershed is forested and includes portions of the Cherokee National Forest (Tennessee) and the Jefferson National Forest (Virginia). The tailwater has an average width of 61 m (200 ft.) and a surface area of about 137 ha (339 acres).

South Holston tailwater (S. Fork Holston River)

TVA addressed low dissolved oxygen (DO) levels during summer and fall and a lack of minimum flow in the tailwater by constructing an aerating labyrinth weir at SFHRM 48.5 in 1991 as part of its Reservoir Releases Improvement Program. The weir maintains a minimum flow of 90 ft^3/s (cfs) and recovers approximately 40-50% of the oxygen deficit as water passes over it (Yeager et al. 1993). South Holston Dam's turbine is typically pulsed twice daily to maintain the weir pool and these releases are aerated via turbine venting aided with hub baffles. The weir and turbine improvements combine to help maintain the target DO concentration of 6 ppm.

A portion of the South Holston tailwater weir dam

The first trout stockings in the South Holston tailwater occurred in 1952 and included fingerling and adult Rainbow Trout and Brook Trout. Subsequently, annual stockings of adult and fingerling Rainbow Trout, as well as sub-adult Brown Trout maintained put-and-take and put-and-grow fisheries. Investigations conducted for TWRA by Bettoli et al. (1999) documented substantial natural reproduction (particularly by Brown Trout) and an overwintering biomass (80%

Brown Trout) of 170-232 kg/ha. Later, Meerbeek and Bettoli (2005) measured an overwintering Brown Trout biomass of 207 kg/ha during 2003-2004 (highest among all Tennessee tailwaters). Mork's (2011) study of large (>18.1 in.) Brown Trout movement in the Boone Lake system verified that some South Holston tailwater fish use the reservoir in winter. No Brown Trout have been stocked in the South Holston tailwater since 2003 because of the excellent wild Brown Trout fishery that has developed. Rainbow Trout have been managed as both a put-and-take and put-and-grow fishery by stocking 47,000 adults and 50,000 fingerlings annually (Habera et al. 2015c).

Management strategy for the South Holston tailwater began shifting in 1999 to focus on the wild Brown Trout fishery given better biological information and corresponding angler support. All snagging was banned in 1999 and two major trout spawning areas (Figure 1) were closed to fishing during November-January. These measures were taken to protect large Brown Trout during the spawning season and to help develop a self-sustaining fishery. A 16-22-inch protected length range (PLR) or "slot limit" was established for the entire tailwater in 2000 with the goal of shifting population structure toward larger fish and protecting spawners (primarily Brown Trout).

2. CURRENT TROUT FISHERY STATUS

2.1 Abundance

TWRA monitors the South Holston tailwater trout fishery at 12 boat electrofishing stations (Figure 1) in March each year to provide an assessment of carry-over trout populations (including size structure) before stocking begins. These 12 stations are sampled (600 s each; 2 h of total effort) during the day at a flow of approximately 2,400 cfs (one unit operating at South Holston Dam). Electrofishing catch per unit effort (CPUE) estimates (fish/h) are calculated and based on trout at least 178 mm (7 in.) long, as this is the minimum size considered fully recruited to the sampling gear and technique.

Electrofishing the South Holston tailwater.

The South Holston tailwater supports a relatively-high-abundance total trout population. Total trout CPUE has averaged 300 fish/h during the past five years and has occasionally reached 400 fish/h (Figure 2). Brown Trout have represented 80-90% of the total

electrofishing catch each year since 2009. Brown Trout CPUE increased after 2001, reaching 361 fish/h in 2011, but has typically been in the 200-300 fish/h range since then (mean, 274 fish/h; Figure 2). Rainbow Trout CPUE has been relatively consistent since 2016, averaging 35 fish/h (Figure 2). Mean Rainbow Trout CPUE was similar during 1999-2003 (39 fish/h) when the average stocking rate (90,000/year) was nearly double the current rate.

The CPUE for trout within the 16-22-inch PLR increased to an average of 25 fish/h during 2004-2008 but has subsequently declined (Figure 3) as overall trout abundance has increased. The catch rate for fish in the PLR averaged only 10 fish/h during the previous management plan term (2015-2020) and has not reached 20 fish/h since 2009 (Figure 3). Brown Trout length frequency distribution for the 2021 sample indicated continued stockpiling of fish below the PLR, with 75% of fish ≥7 inches in the 10-12 inch size classes and 95% below 15 inches (Figure 4).

2.2 Relative Stock Density (RSD-16)

Relative stock densities for trout ≥16 inches (RSD-16) are based on a stock size of 10 inches for both Rainbow Trout and Brown Trout (Willis et al. 1993). Few Rainbow Trout ≥16 (<3% of all fish sampled) have been observed during annual monitoring. Brown Trout attain 16 inches more frequently and RSD-16 consistently improved following implementation of the PLR in 2000 (Figure 5), indicating a shift in population size structure toward larger fish (≥16 inches)—which is what PLR regulations are designed to accomplish. Brown Trout RSD-16 peaked at 23 in 2006, meaning that 23% of all stock-size (≥10 inches) Brown Trout were 16 inches or larger. Ideally, management featuring the PLR would maintain this higher RSD-16 level (e.g., >20), as has been the case in the Norris tailwater (Habera et al. 2020b). However, as overall trout abundance increased and mean CPUE exceeded 200 fish/h, Brown Trout RSD-16 declined and has ranged from 3-8 since 2011—considerably lower than pre-PLR levels (Figure 5).

2.3 Relative Weight (W_r)

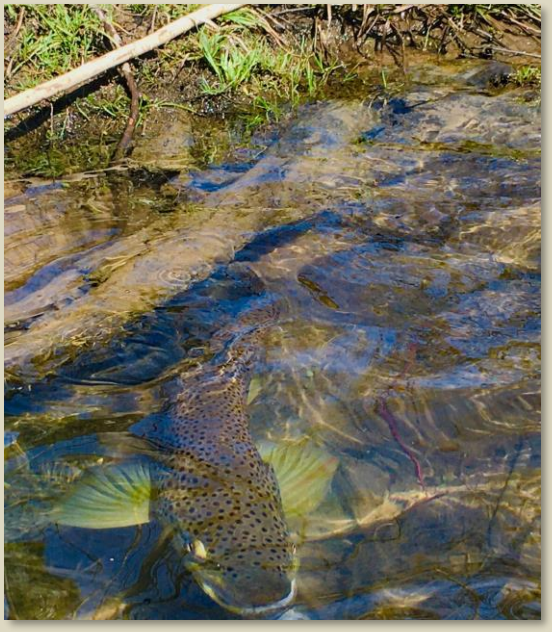
Relative weights (W_r) provide an index of body condition based on standard weight (W_s), with a W_r of 100 considered ideal and values approaching 70 considered low and suggestive of poor health or insufficient food resources (Blackwell 2000). Mean W_r for South Holston tailwater Brown Trout has declined since 2010 from the 90 range to the 80 range for fish in the PLR as well as those below the PLR (Figure 2-6). This decline in W_r coincides with the expansion of Brown Trout abundance in the tailwater and is indicative of density-dependent effects, along with reduced growth and recruitment into the PLR (Habera et al. 2019, 2020b).

2.4 Stocking

Currently, 47,000 adult (9-10 inch) Rainbow Trout are stocked annually in the South Holston tailwater (March-September). Brown Trout stocking was discontinued in 2003 as part of the shift to a management focus on wild fish. Fingerling (~4 inch) Rainbow Trout stocking was reduced from 100,000 to 50,000 fish in 2004 as an initial step toward determining the optimum annual stocking rate. There was no obvious change in Rainbow Trout abundance (mean annual CPUE) following this 50% reduction (Figure 2). An important objective of this management plan during 2022-2027 will be to further evaluate fingerling Rainbow Trout stocking and determine the appropriate amount (which may be none) given the current level of natural reproduction. Accordingly, fingerling Rainbow Trout stocking was discontinued in 2021 and will not resume during this management plan term unless deemed necessary.

2.5 Angler Use

Results for the most recent (2019) South Holston tailwater creel survey (Black 2020) indicated that trout anglers made an estimated 19,441 trips comprising 116,203 hours of effort (Figure 7). Angling pressure (hours) was 35% higher than the 2017 estimate (86,080 hours), and trips increased by 16%. Catch and harvest also increased substantially for both Rainbow Trout and Brown Trout in 2019 relative to 2017, while the highest recent catch estimates occurred in 2014 (Figure 8). Trout harvest rates have increased since 2014, with the overall rate exceeding 20% in 2019 (Figure 9). Anglers have been encouraged to harvest more of the tailwater's smaller (8-12 in.) Brown Trout for several years and the harvest rate for 2019 (11%) indicted that they are doing so. However, this harvest rate likely remains too low to affect abundance based on an average catch of 100,000 fish/year as estimated by the 2014-2019 creel surveys. Trout catch rates have remained in the 1-2 fish/h range, which would generally be considered representative of good fishing (i.e., >0.7 fish/h; McMichael and Kaya



South Holston tailwater Brown Trout

1991; Wiley et al. 1993). Catch per trip generally increased after 2006 (Figure 10), indicating longer trips—3-4 h during 1997-2006; 5-6 h during 2014-2019.

Most South Holston tailwater anglers interviewed during 2019 (52%) were from outside Tennessee (primarily North Carolina and Virginia), as was the case for the 2014 (55%) and 2017 (57%) surveys (Black 2015 and 2018). Substantial majorities of 466 anglers surveyed continue to support the 16-22-inch PLR regulation for all trout (89%) and seasonal spawning sanctuaries (88%) established in 2000.

TWRA completed the J. Forrest Thomas Access Area, located along Rt. 44 near SFHRM 37, in 2018 and it now provides boating access to anglers in the lower portion of the tailwater.

2.6 *Myxobolus cerebralis* Screening

The parasite that causes whirling disease, *Myxobolus cerebralis,* was first detected in Tennessee as the result of surveillance efforts in the South Fork Holston and Wilbur tailwaters in 2017. Adult Rainbow Trout and Brown Trout samples submitted to the U.S. Fish and Wildlife Service's Warm Springs, GA Fish Health Lab tested positive for the whirling disease parasite. The Southeastern Cooperative Fish Parasite and Disease Lab at Auburn University, which began conducting all *Myxobolus* screening for TWRA in 2018, requested that the South Holston tailwater be resampled (using fingerling Rainbow Trout) to confirm the initial (2017) positive results. Sample results for 2018 were also positive (Ksepka et al. 2020), confirming the presence of *M. cerebralis.* Accordingly, TWRA continued to move forward with information and education efforts to inform anglers of the importance of taking biosecurity measures for preventing the spread of spores and infected fish, including cleaning waders and fishing gear and not moving potentially infected fish (especially those used as bait). Because of the presence of *M. cerebralis* in two tailwaters and a few other stocked trout streams, TWRA recommended to the Tennessee Fish and Wildlife Commission that the use of wild-caught trout as bait from *M. cerebralis*-positive waters (including the South Holston tailwater) be restricted to the waters where they were harvested. This restriction became effective March 1, 2020.

Cranial deformity of a Rainbow Trout from S. Holston tailwater (top)—a common clinical sign of infection by the whirling disease parasite (M. cerebralis)—compared to the typical appearance of an uninfected Rainbow Trout (bottom).

South Holston Tailwater

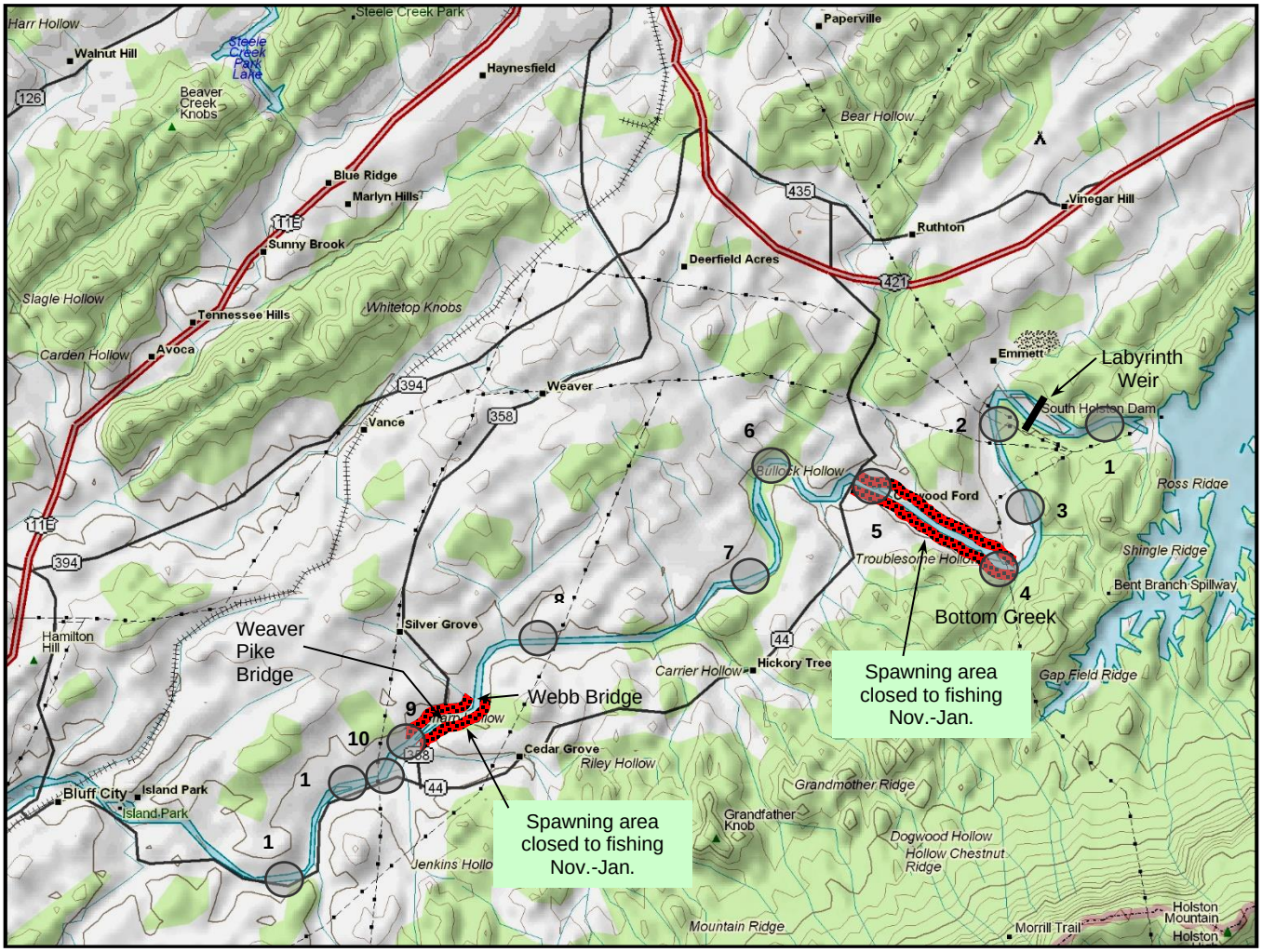


Figure 1. Locations of the 12 annual monitoring stations on the South Holston tailwater (South Fork Holston River).

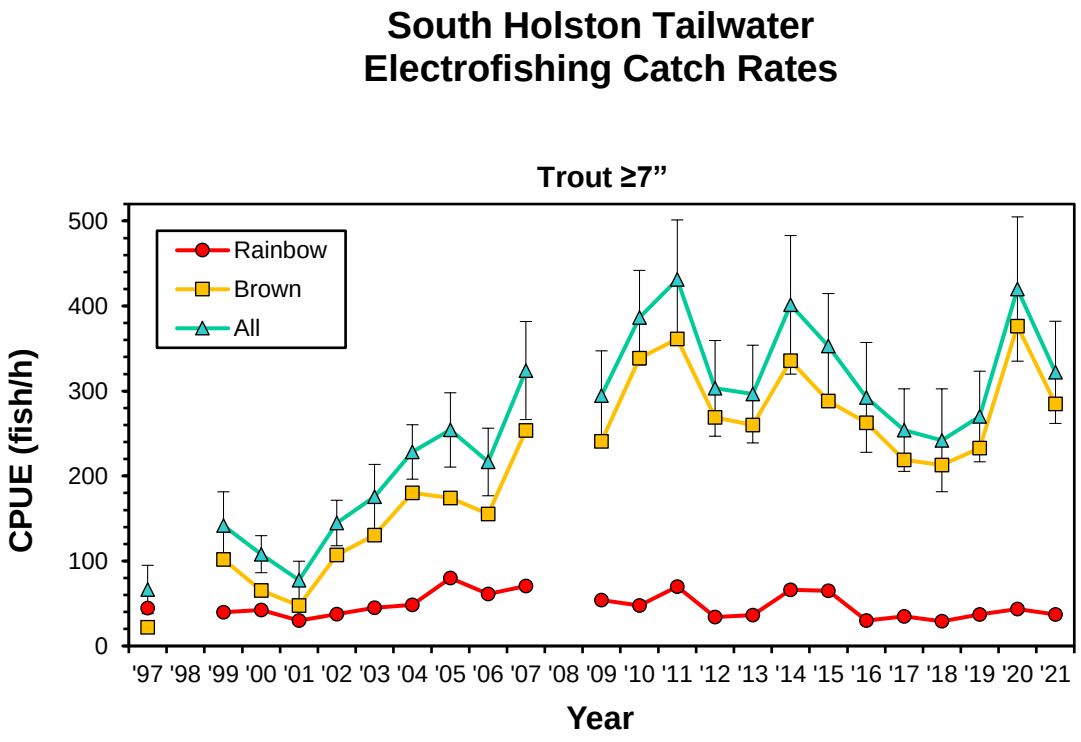


Figure 2. Mean electrofishing catch rates (CPUE) for trout ≥7 in. for the South Holston tailwater. Bars indicate 90% confidence intervals.

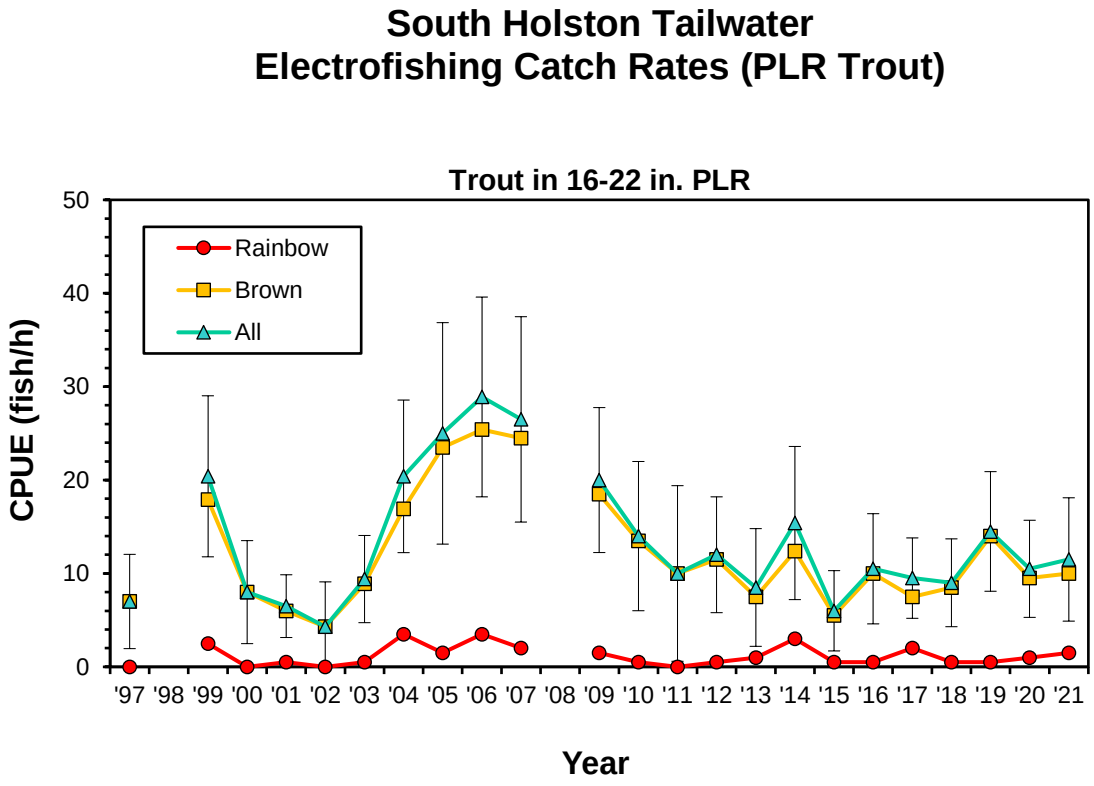


Figure 3. Mean electrofishing catch rates (CPUE) for trout within the 16-22 in. PLR from the South Holston tailwater. Bars indicate 90% confidence intervals.

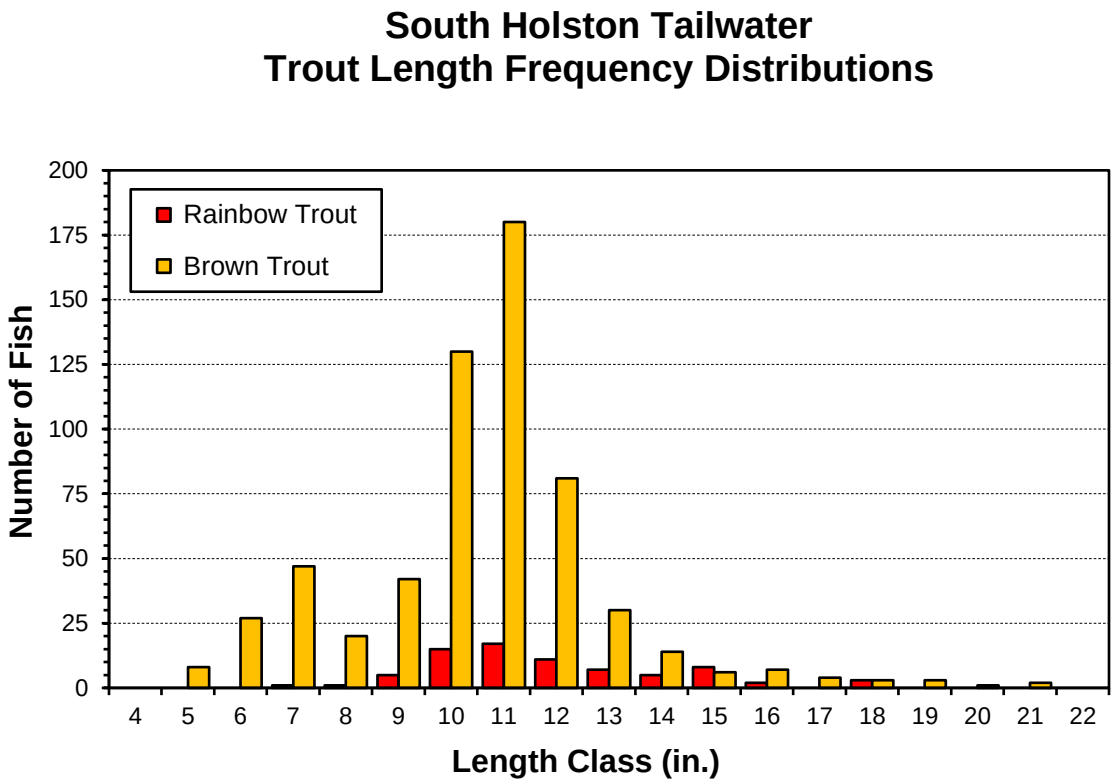


Figure 4. Trout length frequency distributions for the 2021 South Holston tailwater annual monitoring sample.

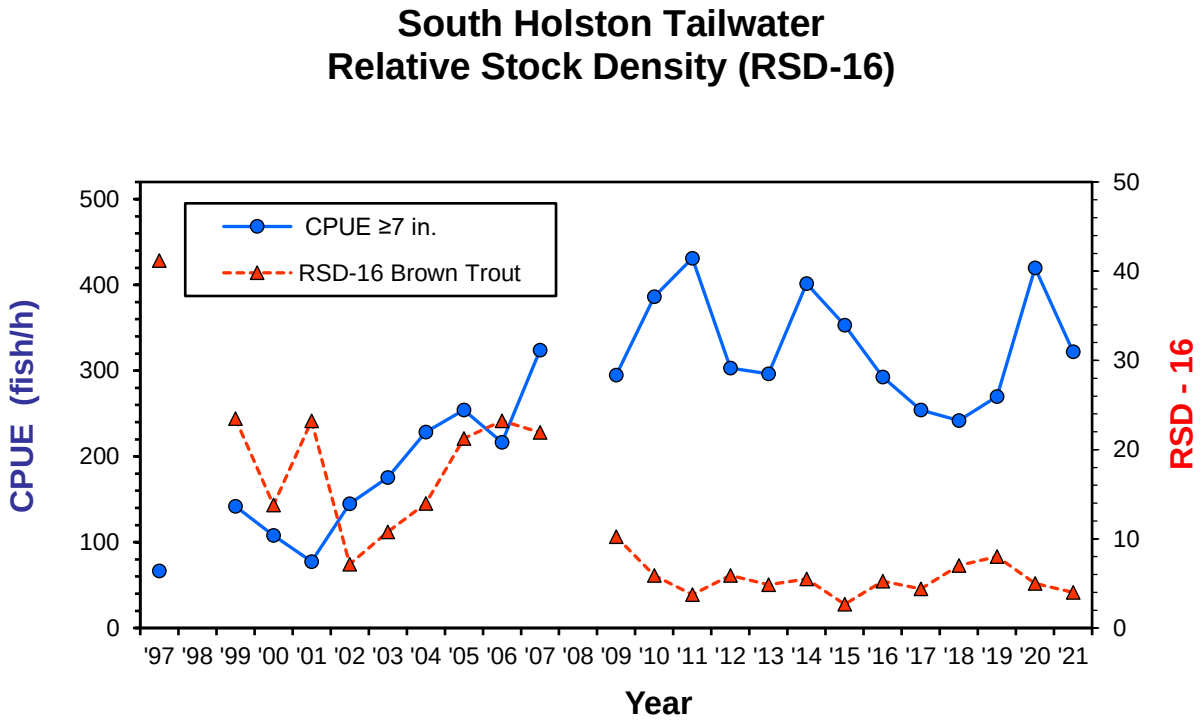


Figure 5. Relative stock density for Brown Trout ≥16 in. (RSD-16) from the South Holston tailwater annual monitoring samples with the corresponding CPUE trend for all trout ≥ 7 in.

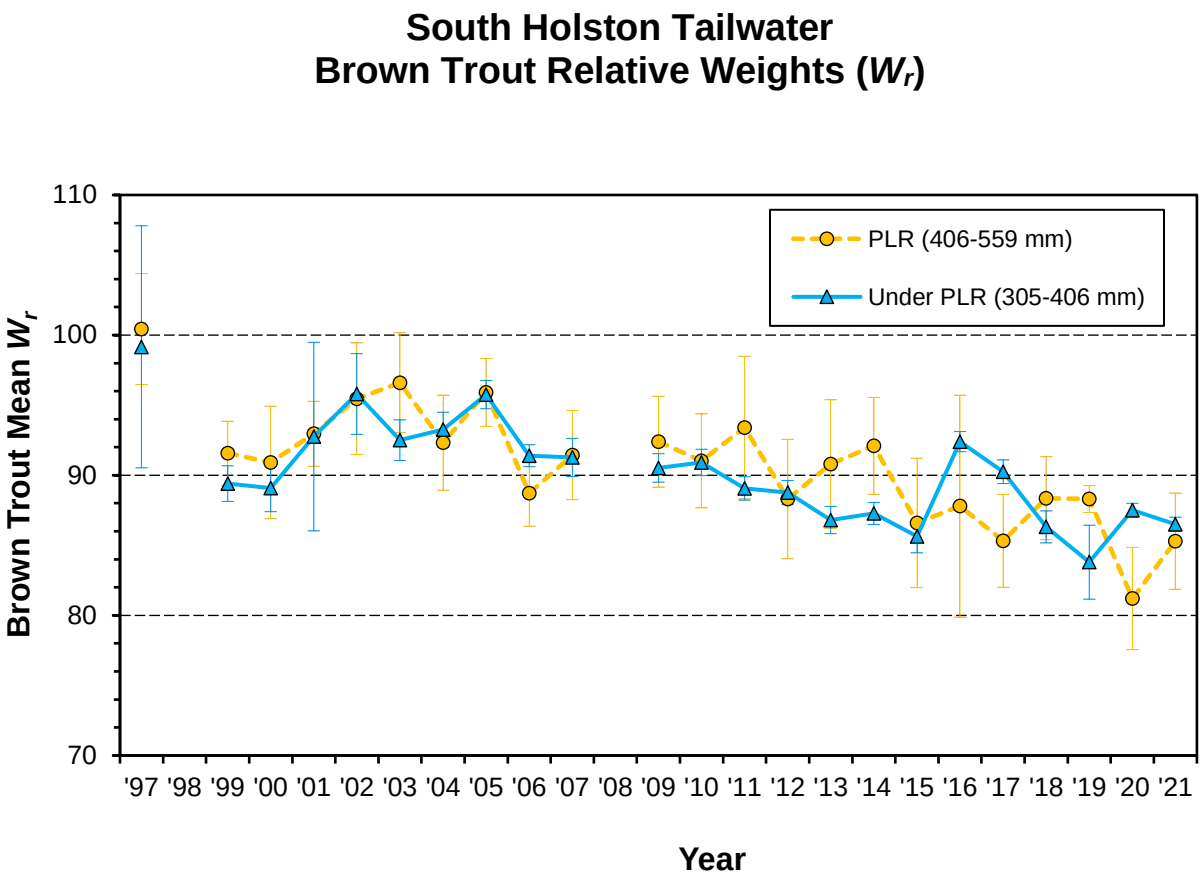


Figure 6. Mean relative weight (W_r) for South Holston tailwater Brown Trout in the length groups below (7-16 in.) and in the 16-22 in. PLR. The standard weight (W_s) relationship used for Brown Trout is: $W_s = 10^{-4.867}\ L^{2.96}$ where W is weight (g) and L is length (mm). Bars indicate standard errors.

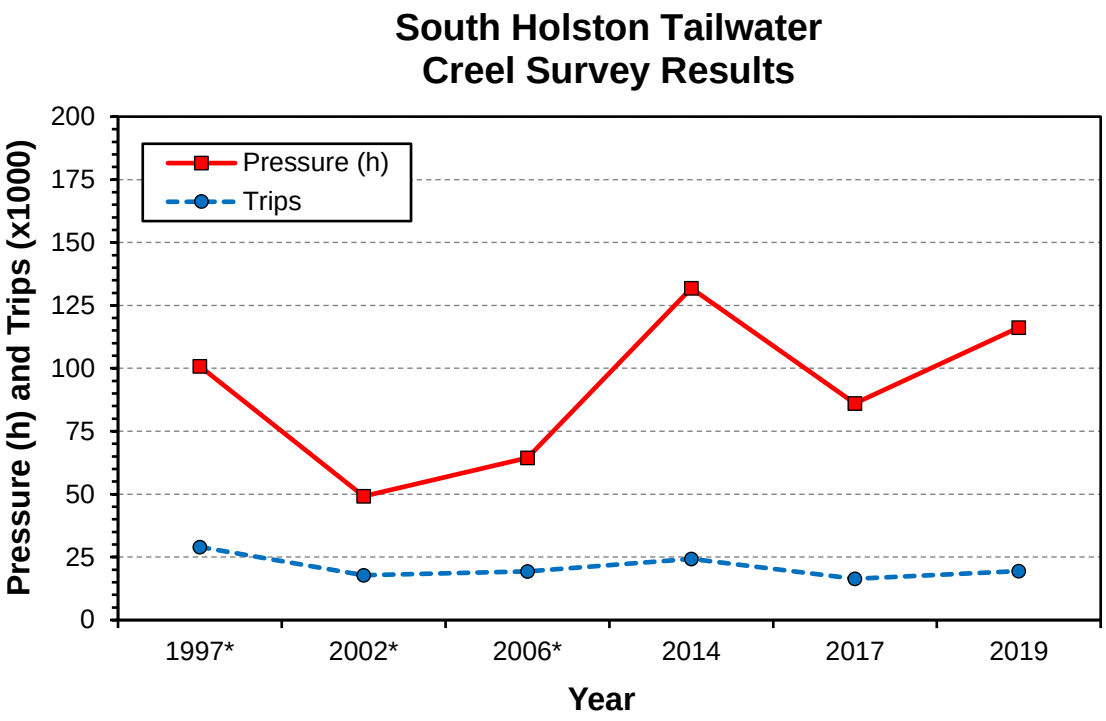


Figure 7. Angler use (pressure and trips) estimated by South Holston tailwater creel surveys (1997-2019). The 1997-2006 surveys covered only March-October.

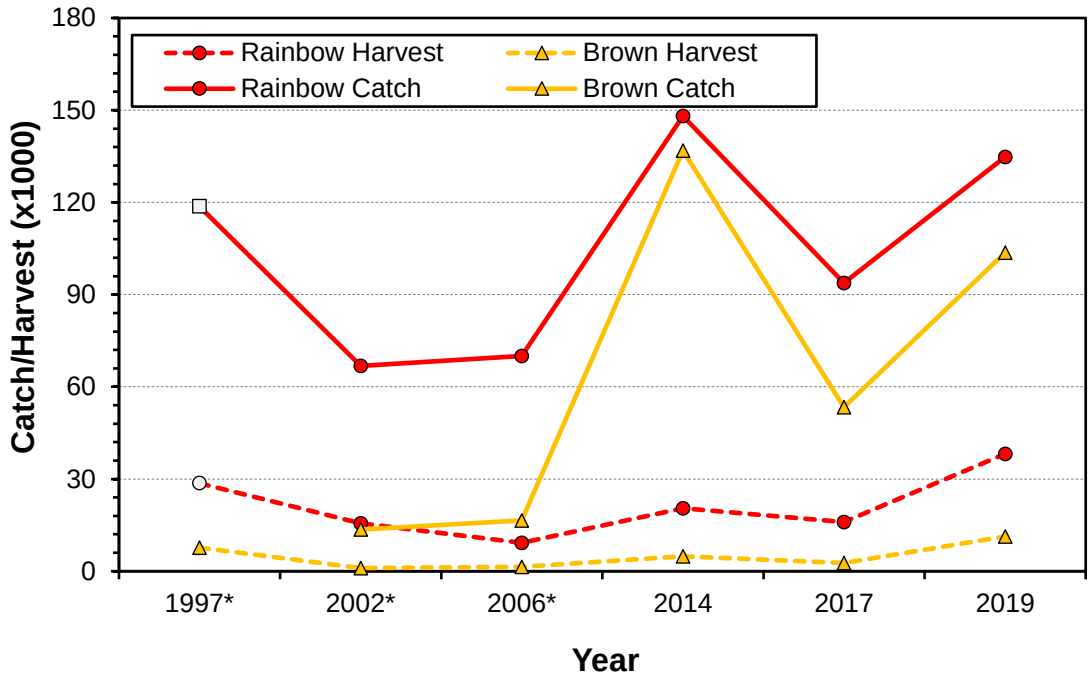


Figure 8. Angler catch and harvest estimated by South Holston tailwater creel surveys (1997-2019). The 1997-2006 surveys covered only March-October; Rainbow and Brown Trout were not separated in 1997.

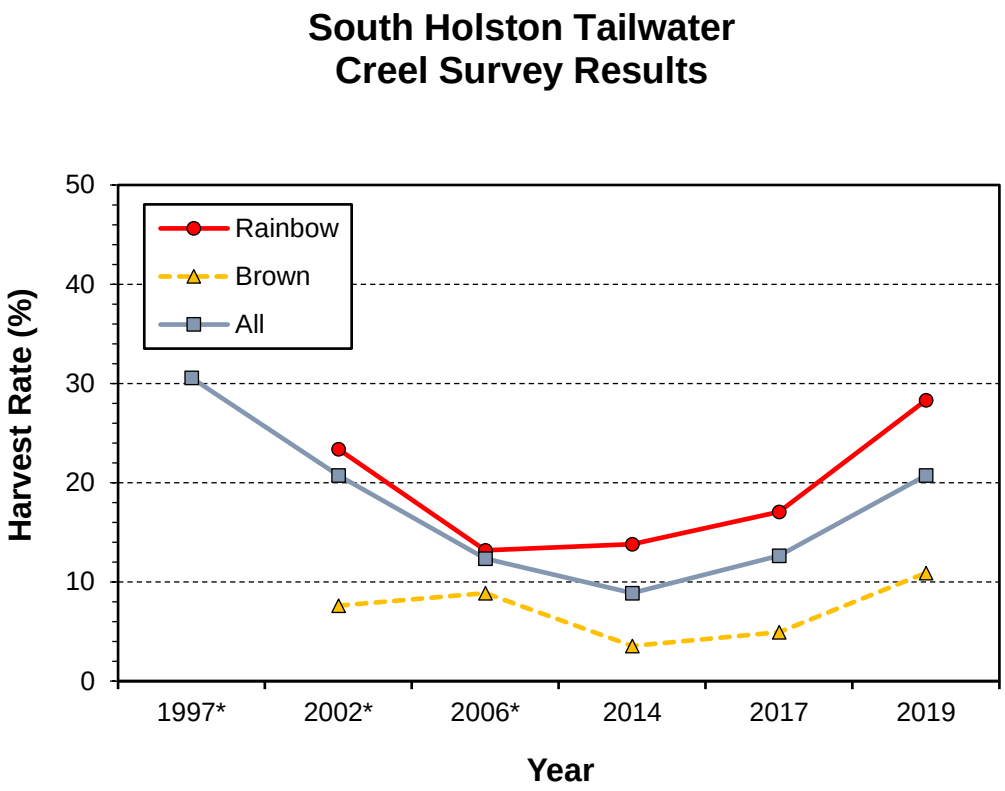


Figure 9. Trout harvest rates for the South Holston tailwater (1997-2019). The 1997-2006 surveys covered only March-October.

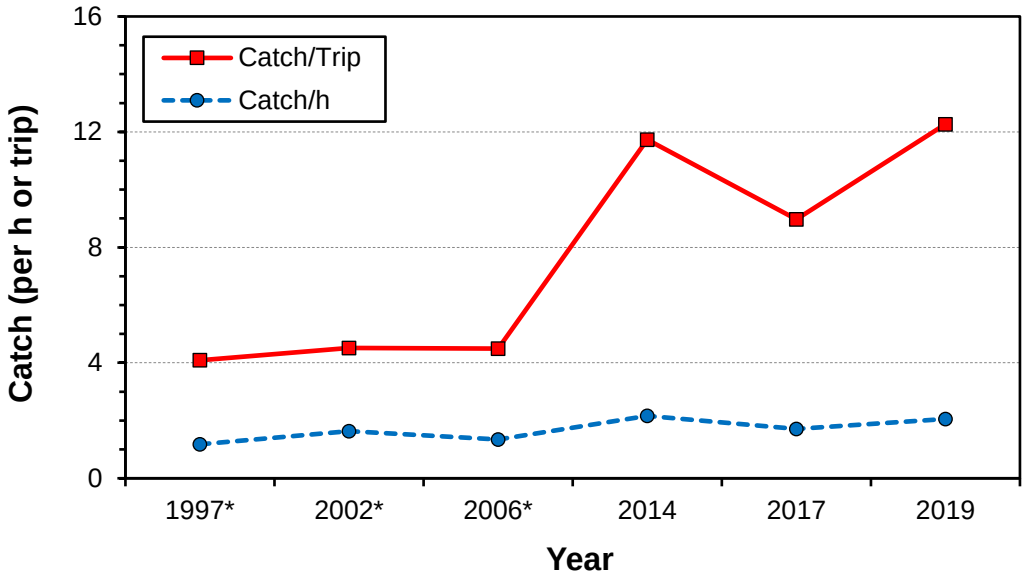


Figure 10. Angler catch per hour and per trip for the South Holston tailwater (1997-2019). The 1997-2006 surveys covered only March-October.

3. MANAGEMENT OBJECTIVES AND RECOMMENDATIONS

The management goal for the South Holston tailwater is to ***"****Continue providing a high-quality, largely self-sustaining trout fishery which provides a variety of angling opportunities"* by:

- Featuring the exceptional wild Brown Trout and developing wild Rainbow Trout populations
- Providing a supplemental hatchery-supported fishery for adult Rainbow Trout
- Maintaining the 16-22-inch protected length range (PLR) regulation for all trout

Based on the goal, management strategies, and status of the tailwater trout fishery, corresponding objectives during 2022-2027 will be:

OBJECTIVES:

1. *Determine the contribution of wild Rainbow Trout to the fishery by suspending fingerling Rainbow Trout stocking beginning in 2021. A mean CPUE of ≥36 fish/h by 2024 would indicate adequate natural reproduction.*
2. *Continue stocking 47,000 adult (9-10 inch) Rainbow Trout annually.*
3. *Ensure that South Holston Dam operations do not impact the tailwater trout fishery.*

Objective 1: Determine the contribution of wild Rainbow Trout to the fishery by suspending fingerling Rainbow Trout stocking beginning in 2021. A mean CPUE of ≥36 fish/h by 2024 would indicate adequate natural reproduction.

Efforts to collect age-0 (fingerling) Rainbow Trout for additional *M. cerebralis* screening produced 60 Rainbow Trout ≤100 mm at three sites throughout the South Holston tailwater in July 2018. Because no fingerling Rainbow Trout had been stocked at that point in 2018, those fish must have been the result of natural reproduction—which may now be more substantial than previously understood. Abundant wild age-0 Rainbow Trout were also observed during similar efforts in Wilbur tailwater in 2019. The fingerling Rainbow Trout stocking rate since 2004 has been 50,000/year, but natural reproduction may be capable of partially or fully replacing those fish. Consequently, the contribution by wild Rainbow Trout to the fishery will be assessed by eliminating fingerling stocking as of 2021. If mean Rainbow Trout CPUE is ≥36 fish/h (5-year average for 2017-2021) for annual monitoring samples by 2024, then fingerling stocking will not resume. Otherwise, fingerling stocking will resume at an appropriate rate (up to 50,000/year). This objective addresses the STMP Hatchery-Supported Fisheries Goal 1, Strategies 1, 2, and 5.

Objective 2: Continue stocking 47,000 adult (9-10 inch) Rainbow Trout annually.

The recommended annual stocking rate for adult Rainbow Trout in the South Holston tailwater will remain at 47,000 9-10-inch fish during 2022-2027. These fish are provided by the Dale Hollow National Fish Hatchery. It is recommended that no retired brood fish from the Erwin National Fish hatchery be stocked as their average size (~18 inches) places them within the PLR and thus excludes them from harvest. This objective addresses the STMP Angling Opportunities Goal 1 and Hatchery Supported Fisheries Goal 1, Strategies 2 and 6.

Objective 3: Ensure that South Holston Dam operations do not impact the tailwater trout fishery.

TWRA will continue to communicate (e.g., at the annual coldwater partners meeting) and work cooperatively with TVA and other partners such as Trout Unlimited (TU) to ensure tailwater flows and temperatures—particularly during summer—do not impact the tailwater trout fishery. Temperature loggers will be deployed as needed to identify any water temperature issues, such as may be associated with extended low flows. Should potential issues arise, TWRA will work with TVA to develop solutions, such as temporary increases in the frequency or duration of water releases, which were successfully employed in 2014. This objective addresses the STMP Habitat Protection Goal 2, Strategy 3.

Evaluation

Sampling of the 12 South Holston tailwater monitoring stations (2 h total effort) will continue annually. Management objective accomplishments will be assessed following completion of the 2027 sampling efforts and if necessary, strategies will be adjusted for the next cycle to meet the management goal. Angler surveys should be conducted periodically (at least every third year) to complement monitoring data and further develop management strategies. These surveys will occasionally include supplemental questions to gauge angler opinion in areas such as satisfaction with the PLR or overall management of the trout fishery. This objective addresses the STMP Angling Opportunities Goal 1, Strategy 6 and Outreach Goal 1, Strategy 2.

Outreach

Results of annual monitoring and angler surveys, particularly as they relate to attainment of the management plan goal and objectives, will be periodically communicated through reports and presentations in both stakeholder and professional forums. This objective addresses the STMP Outreach Goal 1, Strategies 1 and 4.

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APPENDIX

2017-2027 Statewide Trout Management Plan Support

Statewide Trout Management Plan (TWRA 2017)
Mission Statement, Goals, and Objectives
Supported by the 2022-2027 South Holston Tailwater Management Plan

Page 1

Mission Statement:

The mission of TWRA's trout program is to:

"Provide a variety of quality trout angling opportunities that are compatible with Tennessee's other aquatic resources."

Management Goal:

Continue providing a high-quality, largely self-sustaining trout fishery and the variety of angling opportunities it offers.

ANGLING OPPORTUNITIES

GOAL 1. Maintain a variety of trout fisheries

Objective: Continue to offer trout fishing opportunities in streams, tailwaters, reservoirs, and other permanent or temporary habitats that satisfy a diverse public's many different skill levels and definitions of quality

HATCHERY-SUPPORTED FISHERIES

GOAL 1. Optimize use of hatchery trout.

Strategy:

1. Emphasize wild trout management where feasible. Hatchery trout are most effectively used to provide fisheries where wild trout are unsustainable. Shifts to wild trout management have recently been accomplished with Brown Trout in the South Holston and Wilbur tailwaters. Hatchery fish continue to be stocked in some wild trout streams based largely on historic demand. These streams should be re-evaluated and, where possible, stocking should be curtailed or eliminated in favor of wild trout management. Where wild trout cannot support angling pressure, strategies for enhancing abundance (e.g., improving habitat or reducing harvest) should be considered.

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Objective 1:

Determine the contribution of wild Rainbow Trout to the fishery by suspending fingerling Rainbow Trout stocking beginning in 2021

HATCHERY-SUPPORTED FISHERIES

GOAL 1. Optimize use of hatchery trout.

Strategy:

1. Emphasize wild trout management where feasible. Hatchery trout are most effectively used to provide fisheries where wild trout are unsustainable. Shifts to wild trout management have recently been accomplished with Brown Trout in the South Holston and Wilbur tailwaters. Hatchery fish continue to be stocked in some wild trout streams based largely on historic demand. These streams should be re-evaluated and, where possible, stocking should be curtailed or eliminated in favor of wild trout management. Where wild trout cannot support angling pressure, strategies for enhancing abundance (e.g., improving habitat or reducing harvest) should be considered.

2. Avoid excessive stocking rates by determining the minimum number of trout that can be stocked while still providing good fishing. This has been addressed on some tailwaters (e.g., South Holston and Wilbur), but more work (e.g., research, angler use surveys, or trial and error) is needed on other hatchery-supported waters (e.g., reservoirs and winter trout program fisheries) to determine optimum stocking rates.

5. Develop tailwater trout fisheries management plans where these are currently lacking (e.g., Cherokee, Ft. Patrick Henry, and Boone) in accordance with TWRA's Strategic Plan (TWRA 2014); include objectives for optimizing stocking rates based on monitoring data and angler use/harvest information.

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Objective 2:

Continue stocking 47,000 adult (9-10 inch) Rainbow Trout annually

ANGLING OPPORTUNITIES

GOAL 1. Maintain a variety of trout fisheries

Objective: Continue to offer trout fishing opportunities in streams, tailwaters, reservoirs, and other permanent or temporary habitats that satisfy a diverse public's many different skill levels and definitions of quality.

HATCHERY-SUPPORTED FISHERIES

GOAL 1. Optimize use of hatchery trout.

Strategy:

2. Avoid excessive stocking rates by determining the minimum number of trout that can be stocked while still providing good fishing. This has been addressed on some tailwaters (e.g., South Holston and Wilbur), but more work (e.g., research, angler use surveys, or trial and error) is needed on other hatchery-supported waters (e.g., reservoirs and winter trout program fisheries) to determine optimum stocking rates.

6. Work with ENFH personnel to incorporate retired brood fish produced by that facility into the annual allocation process; prioritize DH areas, kids' fishing events, and locations where higher return rates would be expected. Avoid tailwaters and reservoirs where

return rates would be much lower, large fish are typically already present, and special regulations may apply.

Objective 3:

Ensure that South Holston Dam operations do not impact the tailwater trout fishery

HABITAT PROTECTION

GOAL 2. Optimize habitat quality in trout tailwaters.

Strategy:

3. Continue to work with TVA and USACE to maintain water quality improvements that have been made in trout tailwaters, resolve periodic water quality and flow issues that may arise, and monitor situations that may affect water quality in tailwaters (e.g., the extended Boone Lake drawdown). Cooperation between TWRA and TVA was instrumental during June and July of 2011 and 2014 in addressing increased temperatures in the lower portion of the South Holston tailwater resulting from extended periods of minimum flow (90 cfs) releases.

Evaluation:

ANGLING OPPORTUNITIES

GOAL 1. Maintain a variety of trout fisheries

Strategy:

6. Continue conducting opinions surveys periodically to make sure TWRA's management and trout angler preferences align as much as possible.

OUTREACH

GOAL 1. Effectively and interactively communicate with all trout anglers.

Strategy:

2. Continue collecting trout angler preference and satisfaction data via telephone and creel surveys (including reservoirs, DH areas, and winter trout events); incorporate this information where appropriate into management strategies and policy.

Outreach:

OUTREACH

GOAL 1. Effectively and interactively communicate with all trout anglers.

Strategies:

1. Attend various stakeholder group meetings (e.g., TU chapters and local sportsmen's' organizations) to communicate the current status of trout fisheries, discuss current issues and policies, and gauge interest in or support for various management options.

4. Make TWRA's annual trout fishery reports and other related information available through links on the Agency and regional websites and social media pages.