2016-2017 Beaver Tailwater Creel Survey Report

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Trout Management Program Report # AGFC-FD-2022-62-TMP

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Introduction

The White River below Beaver Dam (Beaver Tailwater; TW) offers a unique angling opportunity to a diverse group of anglers. One of the opportunities that Beaver TW provides is a year-round, coldwater trout fishery in which anglers can target Rainbow Trout *Oncorhynchus mykiss* and Brown Trout *Salmo trutta*. As a result, Beaver TW is a very popular and economically important fishery in Arkansas. In a 2014 survey of Arkansas's trout permit holders, 11% of people said that Beaver TW was the body of water they fished most often for trout (Responsive Management 2014). Only the White River below Bull Shoals Dam (Bull Shoals TW) and the Little Red River below Greers Ferry Dam (Greers Ferry TW) were more economically important than Beaver TW. The overall estimated expenditures on the trout fishery ($20.9 million) accounted for 11.6% of total expenditures on Arkansas trout waters in 2013.

In 2006, the AGFC Trout Management Program (TMP) partnered with stakeholders to generate the first Beaver Tailwater Management Plan, which was revised in 2012. Management plans are designed to guide fisheries management through fishery enhancement, habitat improvement, and increased angler involvement and communication. A critical aspect of management plans is focused monitoring of the fishery to assess the success of management efforts.

The AGFC Trout Management Program (TMP) is responsible for conducting special projects, such as creel surveys, on Arkansas' trout waters. Creel surveys are among the most important tools available to fisheries professionals because they provide important information about angling activities and can be used to assess the efficacy of management strategies (e.g., stocking rates; fishing regulations). In the last 25 years, the TMP has conducted two creel surveys on Beaver TW, the most recent of which was conducted from 2008-2010 (Williams et al. 2003; Graham et al. 2012). Beginning on 1 December 2016 and extending through 30 November 2017, AGFC conducted a creel survey on Beaver TW to gather important information associated with fishing activities on the tailwater. The objectives of the creel survey were to:

1) Estimate annual and seasonal angling effort;
2) Examine angler characteristics (e.g., residency, fishing method, and terminal tackle);
3) Quantify annual and seasonal catch rates of trout species;
4) Quantify total catch and harvest of trout species.

Study Area

Tailwater Description

Beaver Tailwater is located in Carroll County in northwest Arkansas (Figure 1). Beaver Dam was built by the U.S. Army Corps of Engineers (USACOE) for the purposes of flood control and hydroelectric power generation and was officially completed in 1966. The resulting trout water below Beaver Dam flows approximately 7.5 miles through northwest Arkansas before entering Table Rock Lake.

Trout Fishing Regulations

The trout fishery in Beaver TW is managed primarily through stocking and regulation. There is currently a river-wide 330-405 mm (13 to 16 inch) protected slot limit on all trout species and a daily creel limit of five trout, of which only one may exceed 406 mm. The regulation has been in effect since 2006. Bait fishing on the entire Beaver TW is restricted to tackle with a single, barbless hooking point. There is one special regulations area (SRA) on Beaver TW that has also been in effect since 2006. Tackle-use within the SRA is restricted to artificial lures with a single, barbless hooking point, but harvest is permitted in the area.

Stocking

Trout have been stocked in Beaver TW since 1966. The current Rainbow Trout stocking rate on Beaver TW was established in 2006, with close to 100,000 fish being stocked annually (Table 1). The Brown Trout stocking rate (~5,000 trout/yr.) was established following the 2008-2010 creel survey, and was recommended due to the low angler catch rates of Brown Trout observed during that survey (Graham et al. 2012).

Methods

The Beaver TW creel survey began in December 2016 and ran through November 2017. Data necessary for the survey was collected during creel flights and access point interviews. Interview data were collected electronically using an Apple I-pad, while flight data was recorded on an angler count sheet. All data analysis was conducted in Microsoft Excel and Minitab 16 by TMP personnel. Angler counts made by flight observers (*see methods below*) were expanded to estimate total fishing effort and variance according to Pollock et al. (1994). Catch and harvest rates were calculated using the mean of ratios estimator (Pollock et al. 1994). Catch and harvest rates were multiplied by effort (i.e., expanded) to estimate total catch and harvest. The estimated number of fishing trips on each tailwater was calculated by dividing total fishing effort by mean fishing time of completed trips (Malvestuto 1996).

Angler Effort

Angler counts were conducted from a plane by a flight observer while flying the length of Beaver TW from Beaver Dam to Houseman Access. For the purpose of the creel survey, the tailwater was divided into four sections (Figure 1). Observers counted all boat, bank, and wade anglers that were actively fishing in each section. Ten flights were conducted monthly with five flights taking place on randomly selected weekdays and five flights taking place on randomly selected weekend days or holidays. The flight direction (upstream or downstream) and start time were also randomly selected. All observations were conducted during daylight hours (i.e., no attempts were made to estimate nighttime angling effort). Monthly data were grouped into seasons in the following manner: winter (December, January, and February); spring (March, April, and May); summer (June, July, August), and fall (September, October, November).

Angler and Trip Characteristics

All public access points between Beaver Dam and Houseman Access were utilized for this portion of the study. Creel clerks were scheduled for 10, 6-hour shifts per month on Beaver TW. Dates (stratified by day type; i.e., weekday or weekend/holiday) and start times (i.e., morning or afternoon) for each shift were randomly determined. The survey design required shifts on 5 weekdays and 5 weekends/holidays each month.

During each shift, the creel clerk completed a daily activity sheet to document the date, day type, start/end time, weather, amount of generation, and comments associated with the interview date. During each interview, anglers were asked a series of questions, including the length of their fishing trip, fishing methods, tackle use, and target species. Tackle was defined as: 1) *artificial lures,* which included crankbaits, spinners, jigs, etc.; 2) *flies*; and 3) *bait*, which included natural bait (e.g., worms, sculpins) and scented baits (e.g., marshmallows, corn, PowerBait®). The numbers of fish caught and harvested were also recorded. Harvested fish were measured (total length; mm) by the creel clerk when possible. Harvested fish that were processed prior to the interview (so that total length could not be measured accurately) were counted but not measured (i.e., unmeasured fish). Released fish were assigned to one of three length categories by anglers: <13 inches, 13-16 inches, and ≥16 inches.

Results and Discussion

Angler Effort

Overall, anglers spent 63,562 h (SE = 4,576) fishing on Beaver TW during the survey and most (64%) effort was by bank/wade anglers. Overall, effort was highest in the summer (20,081 h, SE = 2,249) and lowest in the winter (10,405 h, SE = 2,175; Figure 2). Effort was lower during this survey than was observed during the 1998-2001 (85,629 h) and 2008-2010 (81,164 h) surveys (Williams et al. 2003; Graham et al. 2012).

Angling pressure for the entire river was 5,231 h/km. In each season, angling pressure was highest in section 1 and lowest in section 4 (Figure 3). When compared to angling pressure on other trout fisheries in Arkansas, Beaver TW had lower angling pressure than observed during the most recent creel surveys at Norfork TW (19,261 h/km; Graham and Nault 2019) and Greers Ferry TW (6,747 h/km; Graham 2019; Table 2). However, angling pressure at Beaver TW was similar to that observed during the most recent creel surveys at Bull Shoals TW (5,476 h/km; Graham et al. 2019) and Spring River (5,548 h/km; Kaiser et al. 2020).

Angler and Trip Characteristics

During the survey, a total of 1,148 anglers were interviewed on Beaver TW. Overall, 77% of anglers were Arkansas residents. Anglers from states adjoining Arkansas (MO, TX, TN, OK, MS, and LA) made up the majority (71%) of all non-residents, but anglers from 26 additional states were represented in the survey.

Overall, less than 1% of anglers interviewed were on guided trips. Angling parties spent an average of $114.43 per trip with trips averaging 1.8 days in length. On average, there were two anglers per party and 68% of anglers indicated they had 5 or more years of trout fishing experience.

Most anglers interviewed either bank- or wade-fished during their trip. On Beaver TW, only 10% of interviewees fished from a boat during their trip, compared with 89% who only bank- or wade-fished. Of all anglers, 55% used only bait, 16% used only flies, and 11% used only artificial lures; 72% of anglers used bait at some point during their trips. The percentage of anglers who used only bait on Beaver TW during this survey was higher than on other Arkansas tailwaters surveyed from 2015-16 (range=9%-51%; Graham 2019; Graham et al. 2019; Graham and Nault 2019). Of recent creel surveys, only Spring River had a higher percentage of anglers who used only bait (56%; Kaiser et al. 2020).

Most (92%) anglers indicated their primary target species was trout. Rainbow Trout were the most targeted trout species (18%), while less than 1% targeted Brown Trout. Seventy-three percent of anglers targeted "any trout". Less than 2% of anglers targeted non-trout species, including Black Bass *Micropterus spp.* and Walleye *Sander vitreus.*

Catch rates of Rainbow Trout on Beaver TW (0.91 trout/h; SE = 0.05) were within the range considered to be satisfactory to Arkansas trout anglers (0.8-1.0 trout/h; AGFC, unpublished data; Table 3). Overall, Rainbow Trout catch rates were similar to those observed during the 2008-2010 creel survey (0.90 trout/h; Graham et al. 2012), but lower than during the 1998-01 creel survey (1.3 trout/h; Williams et al. 2003) (Figure 4). Seasonal catch rates of Rainbow Trout on Beaver TW ranged from 0.8 to 1.1 trout/h and were highest in Fall 2017 (1.1 trout/h) and lowest in summer 2017 (0.8 trout/h; Figure 5). Catch rates in the Beaver TW SRA were higher in most seasons than in all other sections, while catch rates in Section 4 were lower in most seasons than in all other sections (Figure 6). The low catch rates in Section 4 are not surprising since only 692 Rainbow Trout were stocked in that section from June 2017 to November 2017. Anglers who targeted Rainbow Trout (N=210) caught 1.02 trout/h (SE = 0.12) while anglers who targeted Brown Trout (N=9) caught 0.98 trout/h (SE = 0.71).

Overall, anglers caught an estimated 57,696 (SE = 4,154) Rainbow Trout on Beaver TW, of which 21,152 (SE = 1,523; 37%) were harvested. During the survey, 99.1% of trout caught and 99.4% of trout harvested were Rainbow Trout. The overall harvest rate of Rainbow Trout was 0.33 trout/h. However, harvest of Rainbow Trout differed by area fished and tackle used. For example, anglers who fished only inside the SRA (section 2) harvested 0.2 trout/h (8%), while anglers who fished outside the SRA harvested 0.4 trout/h (42%). Bait anglers on Beaver TW were more harvest oriented than anglers who used only artificial tackle. Anglers who used only bait harvested 54% of Rainbow Trout caught, whereas anglers who used only artificial tackle harvested 23% of Rainbow Trout caught. Anglers who used only fly tackle harvested 6% of the trout they caught. The tackle restriction (artificial lures with a single, barbless hooking point) inside the SRA likely limited the amount of effort in the area, since the majority of anglers who

fished the tailwater used bait at least part of the time during their trips. All but two of the 1,291 Rainbow Trout measured during the survey were less than 16 inches and the average size of Rainbow Trout harvested was 295 mm. The size distribution of Rainbow Trout harvested was representative of the population size distribution observed during the fall 2017 Beaver Tailwater annual population sample (Figure 7).

Catch rates of Brown Trout were low during the survey (≤0.01 trout/h; Table 3). Overall, anglers caught an estimated 547 (SE = 39) Brown Trout on Beaver TW of which 135 (SE = 10; 25%) were harvested. During the survey, the estimated catch of Brown Trout was lower than what was observed during the 2008-2010 Beaver TW creel survey (1,550 trout; Graham et al. 2012).

Summary

Overall, this survey successfully fulfilled the four stated objectives and provided the TMP with information used to support maintaining the current management practices on the Beaver TW in 2018. Results from this survey indicated that catch rates of Rainbow Trout were within the range deemed satisfactory by Arkansas trout anglers. Results from this survey and annual population samples conducted on Beaver TW also indicate that the size structure of the Rainbow Trout population is skewed towards 10-13 inch fish. Anglers have indicated in multiple surveys that they prefer quality over quantity, so biologists should continue to explore methods to improve the size distribution of trout in Beaver TW. AGFC should also explore avenues to increase angler catch rates of Brown Trout on Beaver TW and future research should examine trout growth and survival rates within the tailwater. Data from this survey, as well as all other data collected on Beaver TW, will be used to inform recommendations when the Beaver TW management plan is revisited.

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Table 1.–Number of trout stocked each year in Beaver TW in Carroll County, Arkansas, from 2006 to 2017. Rainbow Trout and Brown Trout were stocked at mean sizes of 279 mm and 203 mm, respectively.

Year	Rainbow	Brown	TOTAL
2006	89,618	0	89,618
2007	97,380	5,000	102,380
2008	93,046	0	93,046
2009	96,439	5,000	101,439
2010	96,316	5,000	101,316
2011	121,310	3,750	125,060
2012	105,672	6,024	111,696
2013	112,359	5,000	117,359
2014	104,453	0	104,453
2015	91,804	3,760	95,564
2016	93,080	7,400	100,480
2017	90,085	5,059	95,144
TOTAL	1,191,562	45,993	1,237,555

Table 2.–Angling pressure estimates (angler h/km) from the most recent creel surveys on Arkansas trout fisheries. Pressure estimates are in order from highest to lowest.

Year	Trout Fishery	Angling Pressure (h/km)
2015-2016	Norfork TW	19,261
2015-2016	Greers Ferry TW	6,747
2018-2019	Spring River	5,548
2015-2016	Bull Shoals TW	5,476
2016-2017	Beaver TW	5,231
2013-2014	Albert Pike	2,717
2013-2014	Narrows TW	1,217

Table 3.–Angler catch rates (CPUE; trout/h), total catch, harvest rates (HPUE; trout/h), total harvest, and percent of fish caught that were harvested (H%) of each trout species caught during the 2016-2017 Beaver TW Creel Survey.

Trout Species	CPUE	Total Catch	HPUE	Total Harvest	H%
Rainbow	0.91	57,696	0.33	21,152	37%
Brown	0.009	547	0.002	135	25%

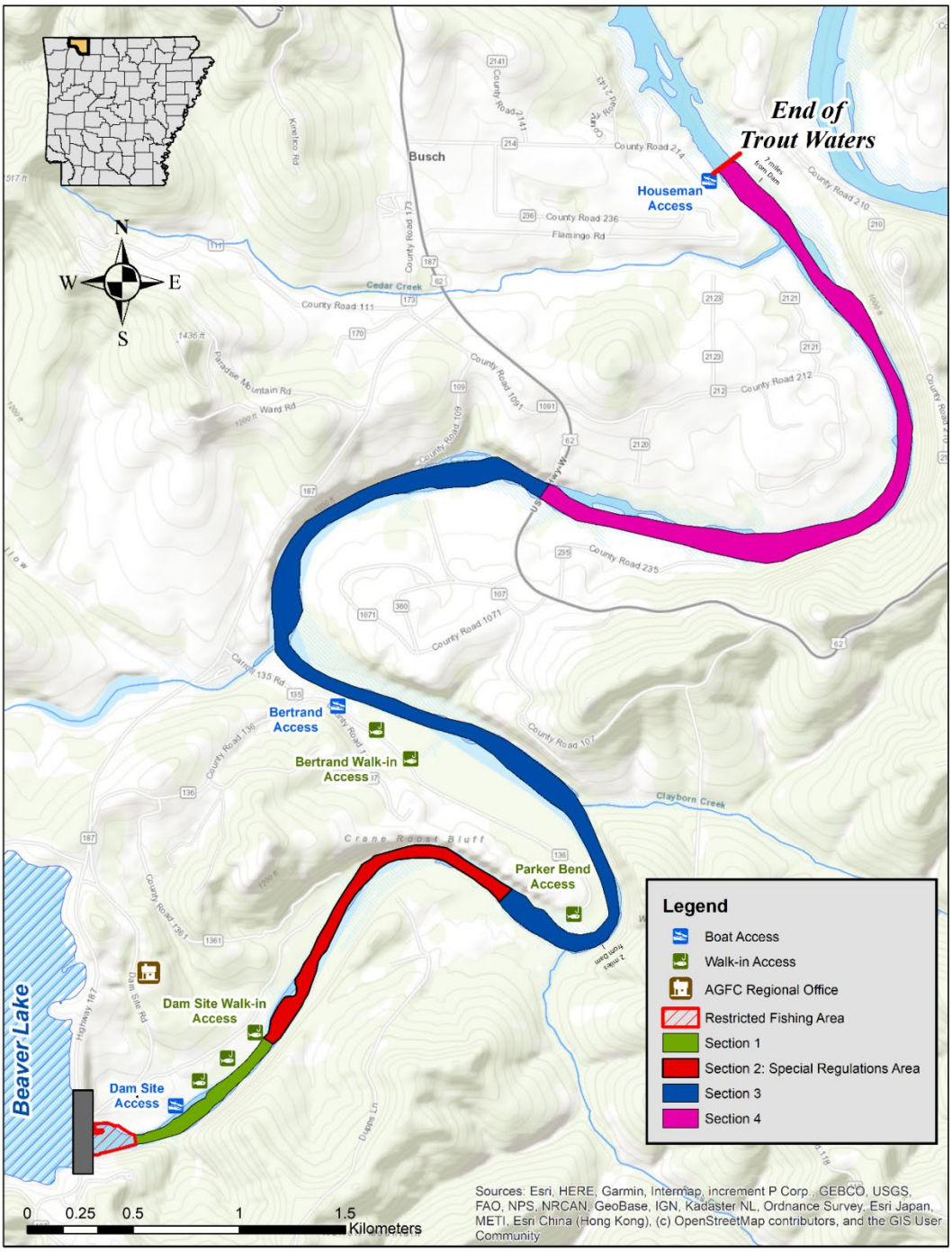

Figure 1.–Map showing the entire study area for the 2016-2017 creel survey of the Beaver TW in Carroll County, Arkansas. The tailwater is defined as the 7.5 mile stretch of the White River from 100 yards below Beaver Dam to the AGFC Houseman Access.

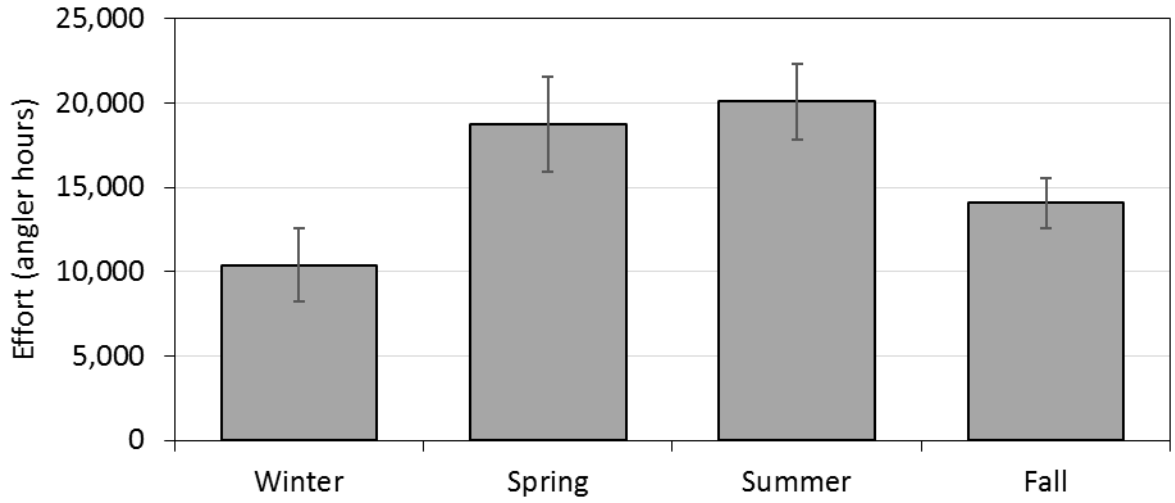

Figure 2.–Seasonal angler effort (angler hours) on Beaver TW in Carroll County, Arkansas during the 2016-2017 creel survey. Error bars indicate the standard errors of effort estimates.

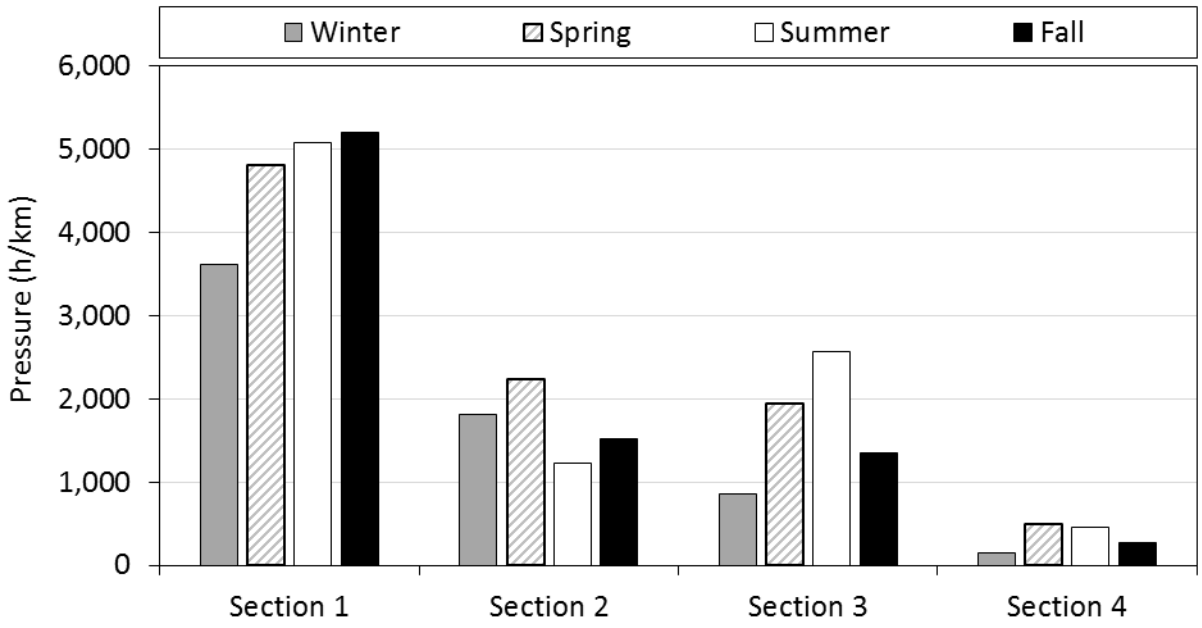

Figure 3.–Seasonal angler effort per kilometer (i.e., pressure) in each section on Beaver TW in Carroll County, Arkansas during the 2016-2017 creel survey. Section 2 is the special regulations area (SRA) on Beaver TW.

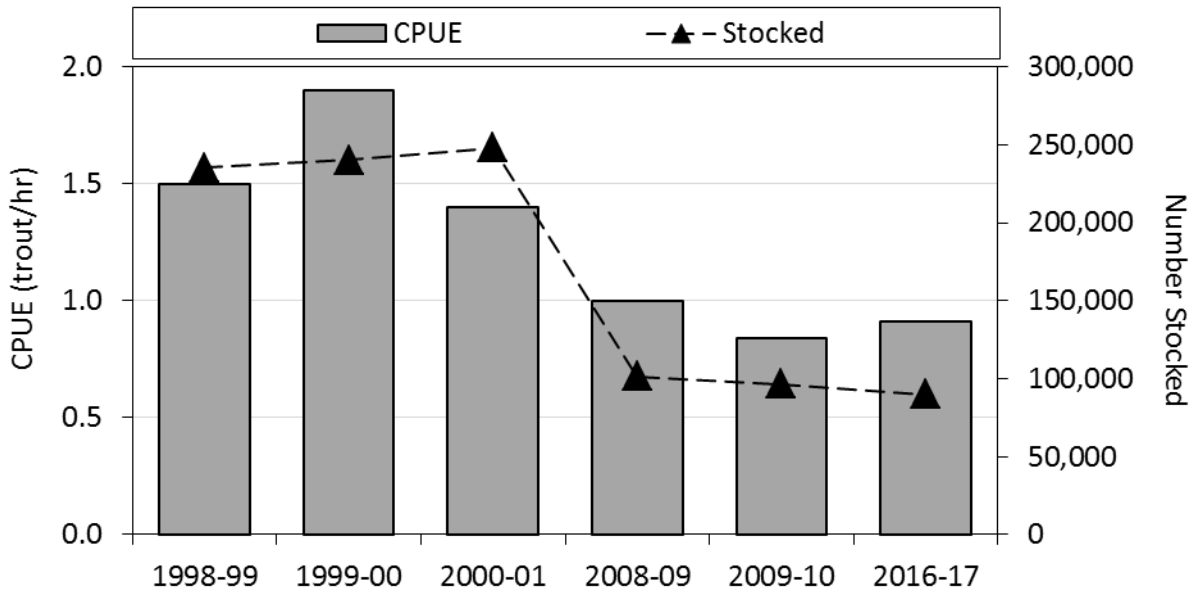

Figure 4.–Annual angler catch rates (CPUE; trout/h) and stocking numbers of Rainbow Trout observed on Beaver TW in Carroll County, Arkansas during three creel surveys (1998-2001, 2008-2010, and 2016-2017).

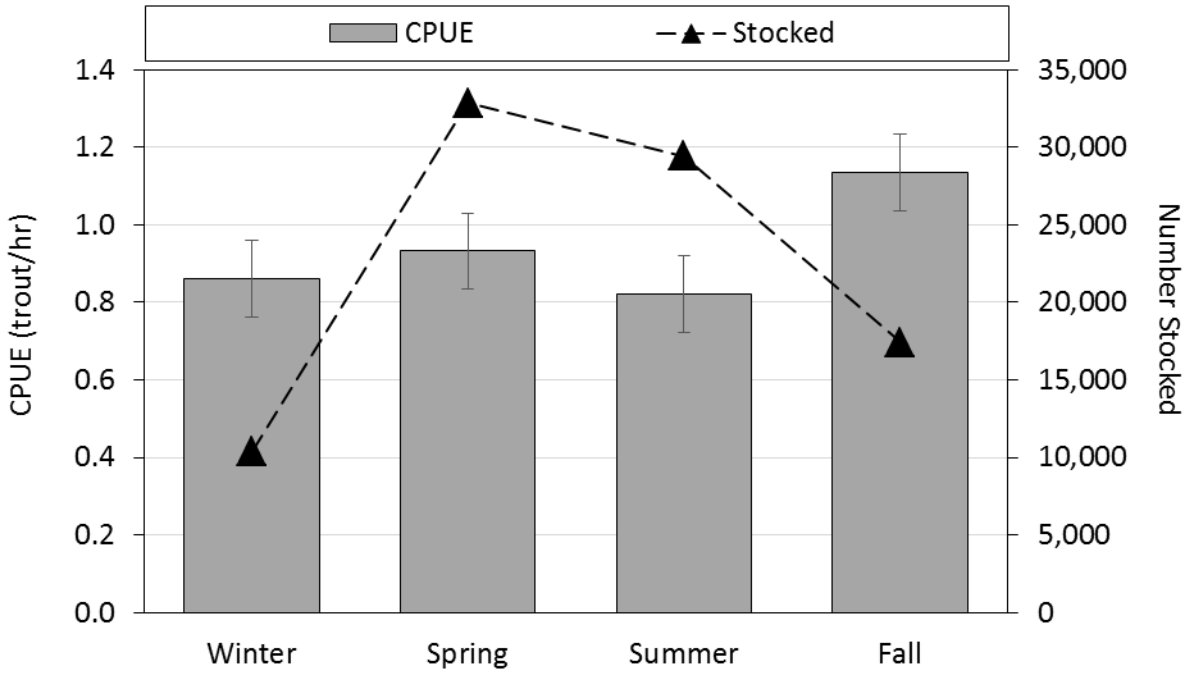

Figure 5.–Seasonal Rainbow Trout angler catch rates (CPUE) and numbers stocked in Beaver TW in Carroll County, Arkansas during the 2016-2017 creel survey. Error bars represent standard error of the catch rate estimates.

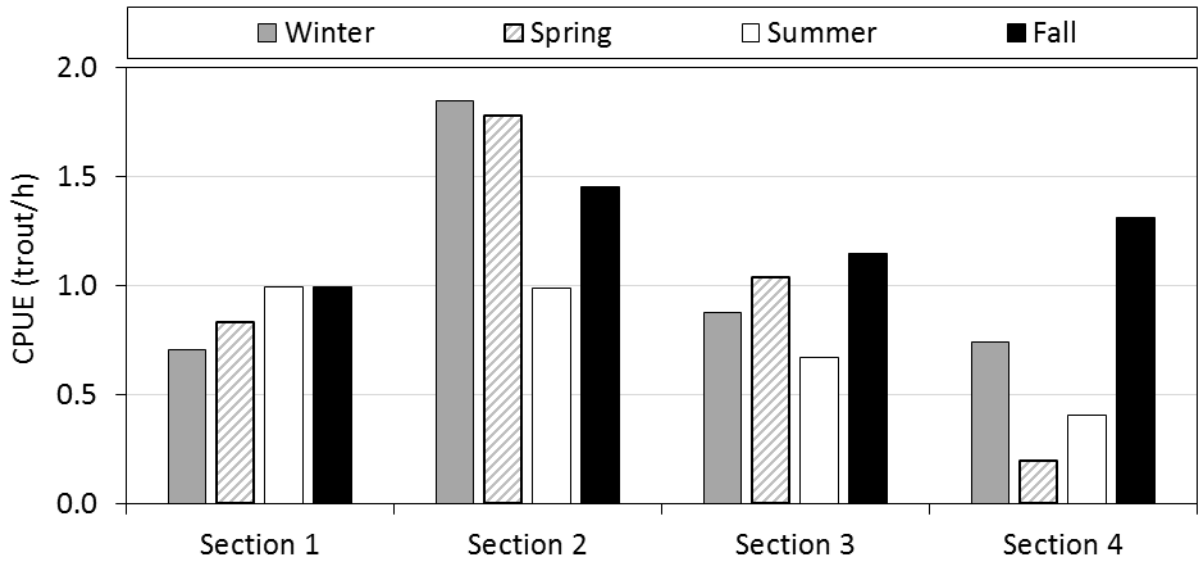

Figure 6.–Seasonal Rainbow trout angler catch rates, by section, observed on Beaver Tailwater in Carroll County, Arkansas during the 2016-2017 creel survey. Section 2 is the special regulations area (SRA) on Beaver TW.

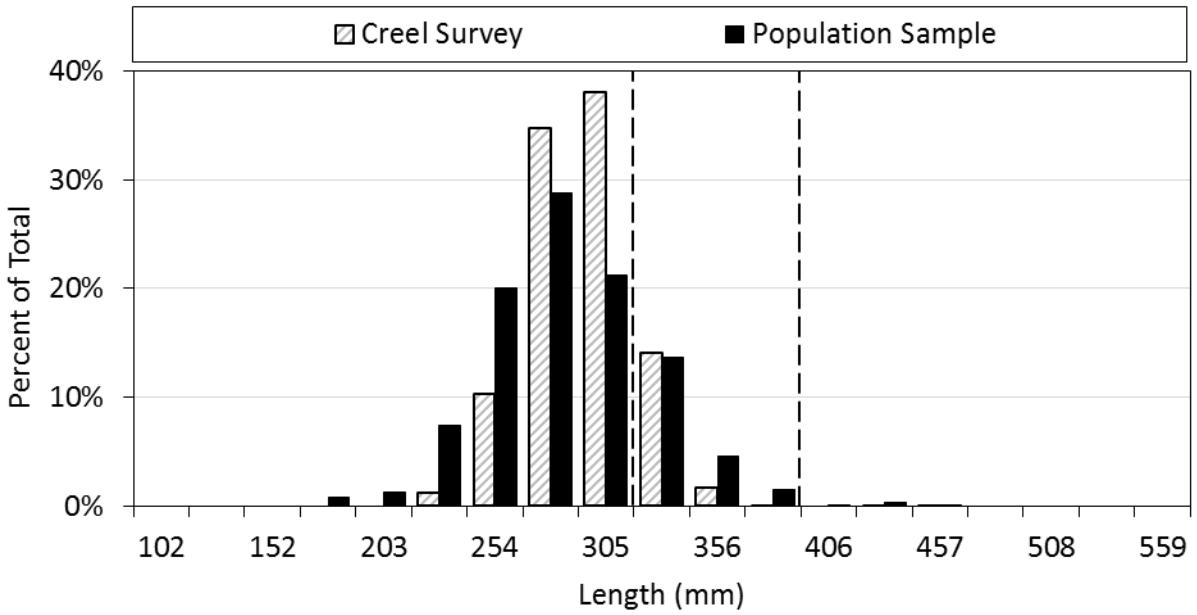

Figure 7.–Length-frequency distributions of Rainbow Trout harvested and measured on Beaver TW in Carroll County, Arkansas during the 2016-2017 creel survey and during the fall 2017 Beaver TW population sample. Dashed lines indicate the protected slot limit of 330 to 405 mm.