TROUT ANGLER UTILIZATION, ATTITUDES, OPINIONS AND ECONOMIC IMPACT at the CANYON RESERVOIR TAILRACE

FINAL REPORT

Tim A. Bradle, Stephan J. Magnelia, John B. Taylor

Texas Parks and Wildlife Department
Inland Fisheries Division
4200 Smith School Road
Austin, Texas 78744
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EXECUTIVE SUMMARY

UTILIZATION

- Total angler counts during the winter 2004/05 study period were low compared to values from similar periods in the mid-1990's. Wade fishing in 2004/05 was extremely difficult due to persistently high reservoir releases.
- A significant decrease in angler utilization occurred when flows exceeded 600 cfs.
- Access sites leased by TPWD accounted for 32% of the angling hours during the survey period.
- Angler utilization was highest on stocking days and Saturdays.
- Angler utilization decreased significantly within two days of the stocking.
- The Canyon Dam access site received the greatest percentage of the fishing pressure (51%).
- Most anglers (68%) were NOT aware that TPWD leased The Cliffs and Camp Huaco Springs to provide free public access.
- Recommendations for increasing utilization included; 1) increasing the number of stockings 2) stocking on Fridays or Saturdays 3) decreasing the time period between stockings 4) increasing the number of free access sites 5) increasing the effectiveness of promotional efforts 6) promoting boat fishing float trips when flows exceed safe levels for wading.

ATTITUDE AND OPINIONS

- 90% of anglers were moderately to extremely satisfied with their trout fishing experience at the tailrace.
- The TPWD leased access site Camp Huaco Springs had the highest angler satisfaction rating of all access sites surveyed.
- Of the anglers who used the Canyon Dam access, most (63%) felt "crowded;" however, they also felt that the site "had good fishing" (83%), "was easy to locate" (98%) and "gave the best chance to harvest trout" (92%).
- 59% of anglers supported current regulations inside the special regulations zone and 72% supported current regulations outside the zone.
- Anglers agreed that Tailrace fishing regulations were easy to understand.

- 79% of anglers indicated that a scheduled trout stocking was a primary reason for their trip, and 54% found out about stockings through the TPWD Inland Fisheries web page.

- Anglers felt there were NOT enough free public access sites on the tailrace and they supported additional free public access sites both inside the special regulation zone (75%) as well as outside the zone (81%).

ECONOMICS

- Total economic value of the Lower Canyon Reservoir tailrace trout fishery from December 2004 to February 2005 was estimated at $164,537.

- Over the 58 day creel period every dollar spent by TPWD on trout and lease access sites generated $3.93 of economic impact to Comal County.

- Economic impact on retail sales in Comal County by non-local anglers was $86,237.

- 62.6% of all anglers traveled to the tailrace from outside Comal County. They traveled an average of 122 miles one way.

- Total economic value/impact in 2004/05 was probably less than what could be expected during a similar time period with lower reservoir releases (< 600 cfs).

- The lease and stocking of The Cliffs and Camp Huaco Springs generated $4.75 of total economic value for every dollar spent by TPWD.

- One additional (scheduled) trout stocking would generate an additional 2,337 angler trip days, which would result in an additional $75,029 more in total consumer value.

- Direct expenditures made by all trout anglers between December 31, 2004 and February 26, 2005 totaled $126,664.

- State revenues generated from state sales taxes and fishing licenses was $21,258.

- Anglers were willing to pay 34.5 – 38.0% more for their trip costs before they would cancel their trip to the river, for a consumer surplus of $42,728.

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INTRODUCTION

The Canyon Reservoir tailrace is a 22.2-km portion of the Guadalupe River located below Canyon Reservoir north of the City of New Braunfels in Comal County, Texas (Figure 1). Canyon Reservoir was impounded in 1964 for the purposes of water storage, flood control and water-based outdoor recreation. The U.S. Army Corps of Engineers is the reservoir controlling authority. The reservoir's tailrace is extremely popular with tubing and rafting enthusiasts during the summer months.

The Canyon Reservoir Tailrace Trout Fishery

Rainbow trout were first stocked in the Canyon Reservoir tailrace, a hypolimnetic reservoir release tailrace located in south-central Texas, in 1966 by the Texas Parks and Wildlife Department (TPWD) (White 1968). The Guadalupe River Chapter of Trout Unlimited (GRTU) has also stocked the tailrace since the early-1970's. The tailrace extends for approximately 22.2 km downstream from the stilling basin of Canyon Dam. It is one of the most popular winter trout fisheries in Texas (TPWD, unpublished data) and is listed as one of the United States top 100 trout fishing destinations (Ross 2005). While the tailrace always has supported a popular put-and-take winter (December to February) fishery, water temperatures from May through October were thought to exceed lethal levels (>25 C) for trout. Elevated water temperature has limited the scope of other tailrace trout fisheries until reservoir releases were made for maintaining suitable downstream water temperature. Axon (1974) reported water temperature in the White River below Bull Shoals Reservoir, Arkansas was a factor limiting that rainbow trout fishery, until the U.S. Army Corp of Engineers (USACE) agreed to provide adequate flows for keeping water temperatures below 21.1 C. Similarly, the Oklahoma Department of Wildlife Conservation made reservoir release recommendations for maintaining downstream water temperature at or below 21.1 C on the Mountain Fork River below Broken Bow Reservoir (Harper 1994). Thus, 21.1 C can be considered a maximum threshold water temperature for maintaining tailrace trout fisheries.

Oversummer survival and acceptable growth of rainbow trout from an April stocking was documented in the Canyon Reservoir tailrace in October 1966 (White 1968), although the distance below the outflow where this occurred was not specified.

Many anecdotal reports of oversummer survival were also received by TPWD from the public. Oversummer survival of trout was again documented up to 17.1-km downstream throughout the 1990's (Magnelia 2004). Based on documented oversummer survival in 1993 and 1994 an experimental put-grow-and-take harvest regulation (457-mm minimum length limit and 1 fish daily bag limit) for rainbow and brown trout was implemented in 1997 on a portion of the tailrace from 6.3 to 22.2 km downstream from the stilling basin of Canyon Reservoir (Figure 2). Outside this special zone statewide harvest regulations for trout are in place (no length limit and a 5 fish daily bag (any combination)). However, data collected after implementation of the experimental regulation indicated water temperatures in all or much of the special regulation zone often exceeded 21.1 C, which limited or negated the effectiveness of a put-grow-and-take regulation strategy (Magnelia 2004). In May 2003, a water release contract between GRTU and the Guadalupe Blanco Authority (GBRA) was implemented with the specific objective of keeping water temperatures < 21.1C from May through September in sections of the tailrace > 6.3 km downstream from the dam. The effectiveness of this change for the purpose of increasing rainbow trout population density in the special regulation zone is currently being evaluated.

Angler Access Sites

Rainbow trout were traditionally stocked during the winter months (December – February) by TPWD at four public access sites. These sites were the United States Army Corp of Engineers (USACE) fishing pier directly below Canyon Dam (P1), a private campground (Whitewater Sports) at the easternmost bridge crossing on State Highway 306 (P2), the fourth bridge crossing on River Road in the town of Sattler (P3) (accessed at a private RV park (Rio Raft)), and a private campground (Camp Beans) located just upstream from the 3rd bridge crossing on River Road (Figure 2). At sites P2, P3 and Camp Beans anglers were charged an access fee. During the winter (December to March) of 1999 Camp Beans was temporarily closed after decades of being one of the tailraces' most popular access areas. From 1992 to 1998, 27% of the tailraces' fishing pressure was concentrated at this site (TPWD, unpublished data). In 2002, it was permanently closed to the public. In an effort to increase public access, sites P4 and P5 (Figure 2) were leased and stocked by TPWD. No access fee was

charged at these sites for fishing. In addition to sites stocked by TPWD, GRTU annually stocks and leases access sites for their members. These sites are not accessible by the general public unless they float or wade into them.

Fisheries Management

Established in the Inland Fisheries Division's strategic plan, the mission of providing "…the best possible fishing opportunities while protecting and enhancing the state's vast freshwater resources" commits the Division to maintaining quality fish communities throughout Texas, while maximizing angler satisfaction (TPWD 1999). The Inland Fisheries Division's strategic plan addresses many issues regarding their mission, and specific research and communication goals are established regarding angler attitudes, opinions, satisfaction and economic benefits of freshwater fishing in Texas. This research, in part, addresses goals 4-6 of that plan. Furthermore, projects such as this one are also directed by the Department's Land and Water Resources Conservation and Recreation Plan (TPWD 2002). The plan specifically sets priorities to improve recreational fisheries, including the assessment of trends in angler preferences, expectations, catch rates, socio-demographics, satisfaction and economic importance of freshwater recreational fishing in public waters.

The number of anglers fishing for rainbow trout on the Canyon Reservoir tailrace has declined dramatically since the early and mid-1990's. It appeared reservoir releases during the traditional trout fishing months (December through February) had generally increased concurrently with the decline in angler utilization. Bettoli and Bohm (1997) found a strong inverse relationship between average daily discharge and estimated fishing pressure on a Tennessee tailrace trout fishery. In addition to increased river flow, other factors such as weather, trout stocking periodicity, fishing regulation changes and access site closures may have negatively impacted angler utilization. An examination of these factors in relation to historical angler counts, as well as economic and angler attitude and opinion information, was needed so that practices to increase angler utilization might be implemented.

METHODS

Angler Surveys

The economic impact portion of this study was developed following procedures used in a similar assessment of Lake Fork, Texas anglers in 1995 (Hunt and Ditton 1996). The application of creel intercept and follow-up mail survey procedures (Ditton and Hunt, 2001) were used to reach trout anglers on the Canyon Reservoir Tailrace.

A creel survey was conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2004). Twenty creel survey days were randomly selected between December 31, 2004 and February 26, 2005. Four additional days which coincided with advertised trout stockings were also surveyed, since angler activity was expected to be high on these days (Malvestuto et al. 1978, Stanovick and Nielsen 1991). Angler access sites P1, P2, P4, P5 (Figure 2) were surveyed each creel day for a period of 1.25 hours. Instantaneous angler counts were made at each site at a randomly selected time within the creel period. Angler catch rate (CPUE) was compared between sites P1 and P5 using a Students t-test (alpha=0.05). Data was transformed using the formula log10(trout/hour + 1). In addition to catch and harvest data, creel clerks also collected names and addresses of anglers who agreed to participate in the follow-up survey. The survey instrument (Appendix A) was mailed to them soon after the creel intercept. Follow-up procedures for improving angler responses on the survey were used, following selected methods described by Dillman (1978).

Each access site was stocked four times from December 2004 through February 2005. A total of 17,175 trout were stocked at the four sites, with the total number of trout split equally between the stockings. The total cost per trout was estimated at $0.99, which included cost associated with delivery and feed (TPWD, unpublished data). Expected fishing effort, based on historical angler counts (TPWD, unpublished data), was used to allocate the number of trout stocked at each site. An additional public access site was stocked (site P3, Figure 2), but was not surveyed, because angler counts in prior years indicated utilization was low (2-10% of total).

Survey Instrument

A self-administered mail questionnaire (Appendix A) was developed in order to measure attitudes, preferences, opinions and expenditures of trout anglers. Survey topics included trip expenditures and values, participation, satisfaction, preferences and attitudes regarding trout fishing quality and management options, and socio-demographic information. Closed-ended questions were used primarily for measures of angler preference, motivation, satisfaction and attitudes. Open-ended questions were used to determine expenditures related to their fishing trips.

Angler Access Sites

Four public access sites were chosen for creel surveys. Two of the sites were traditional sites used by anglers (Figure 2, P1 and P2). At site one (P1) there was no charge for access (USACE property). Trout were stocked off a fishing pier and angling activity (bank and wade fishing) was concentrated at the pier and directly below it. At site two (P2) anglers were charged a daily access fee to fish. There is bank and wade angling opportunity along one side of the river for about 0.8 km. Free access to the opposite riverbank at this site is available by using the public right-of-way, although this is technically trespassing.

Two privately owned sites (Figure 2, access P4 (The Cliffs) and P5 (Camp Huaco Springs)) were leased by TPWD specifically for giving anglers additional free access (no fee charged) from December 29, 2004 to March 17, 2005. These sites had been leased annually since 2002 by TPWD during a similar time frame. Site P4 is directly across the river from the Camp Beans access site (closed to the public since 2002), which from 1992-1998 accounted for on average 27% of the tailraces angling activity from December through February (TPWD, unpublished data). Site P4 provided anglers parking and a path to the river for wade fishing only and was located in the special trout fishing regulation zone. Site P5 is a private campground where good bank and wade fishing access was available for about 2.4 km. Three of the four access sites where creel surveys were conducted were outside the special trout regulation zone (Figure 2).

Availability of leased sites was promoted using the TPWD Inland Fisheries web page, telephone interviews with outdoor writers, written news releases (Appendix B) and signage (Appendix C) posted at non-leased sites. Newspapers from Austin, San

Antonio, San Marcos, New Braunfels, Sattler and Canyon City were contacted regarding scheduled stockings and availability of TPWD lease areas. Entrances to leased access sites were clearly marked with signage (91 x 91 cm) alerting anglers to availability. This signage was clearly visible from River Road. These same promotional efforts had been used in previous years to alert anglers to the availability of leased sites. Creel clerks also alerted anglers, expressing interest in alternative fishing locations, to the availability of leased sites.

Angler Utilization

Creel statistics (fishing pressure, catch, harvest, etc) in the 2004/05 survey were analyzed according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2004), except each creel site was considered a separate stratum. Total fishing pressure was the sum of the estimates for each site.

Angler trip length (hours fished at time of the interview) in 2004/05 was compared to trip length in 1993/94 (Magnelia 2004) using a Students t-test (alpha=0.05). Trips less than 0.25 hours were eliminated from the 2004/05 data set, because anglers encountered fishing less than 0.25 hours in 1993/94 were not interviewed. Data was transformed using the formula log10 (trip length at time of interview) prior to the analysis.

Using the SAS general linear modeling procedure (PROC GLM) (SAS 1990), an analysis of covariance (ANCOVA) model was developed to examine the effects of flow (cfs), number of days post-stocking, day of the week, access site, ambient air temperature and precipitation on angler counts. In addition to angler counts collected in 2004/05, counts from 1992-1999 were also used in the analysis. Counts during 1992 and 1994-1999 were made two hours following the initial stocking, at 3:00 PM on one weekday following the stocking date as near as possible and at 3:00 PM on one weekend day following the stocking date as near as possible. Creel clerks traveled the entire perimeter of each site and counted anglers actively fishing. Angler counts from a creel survey conducted from December 1993 to February 1994 were also used in the analysis. Procedures for collection and analysis of these data are described in Magnelia (2004). A total of 450 angler counts were used in the analysis. Precipitation

was coded as a categorical variable (yes or no). For comparing angler utilization at high (>550 cfs) versus low flows, observations below 600 cfs were transformed to a step function (values < 600 cfs=0). This transformation was appropriate since only flows above 550 are considered unsafe for wade fishing. Because of a paucity of angler counts between 550 and 600 cfs, 600 rather than 550 cfs, was used as the demarcation for high versus low flows. Flow rates from December through February 1992-1997 and 1998-2004 were compared using a Students t-test (alpha=0.05). Significant relationships were determined with an alpha of 0.05.

Economic Values

This study, in part, was to determine the economic value of trout fishing on the Canyon Reservoir tailrace, including direct angler expenditures, total economic impact, and angler consumer surplus. There were several approaches used to evaluate the economic contributions of the trout anglers: 1) direct expenditures, which are expressed as the total annual dollars spent by anglers resulting from fishing trips to the tailrace; 2) consumer surplus, which is the total annual dollars that anglers would spend before they would discontinue fishing at the tailrace (this amount can be viewed as potential dollars not realized to the economy); 3) economic impact, which is a result of new dollars entering an economy and its subsequent impact realized after expenditures had passed from one hand to another; and 4) total economic value, which is the combined total annual direct expenditures made by local anglers, total impact made by non-local anglers and total consumer surplus.

Angler expenditures were stratified for analysis based on where they were spent. Those expenditures made in Comal County (within a 48.3-km radius of the tailrace) were assessed as local area expenditures, and expenditures made elsewhere were assessed as non-local expenditures (outside the local area). Total direct expenditures were estimated as the total dollar amount spent during fishing trips to and from the river. The estimates for total expenditures were calculated by multiplying the estimated total number of local, non-local, and out-of-state angler fishing days for the creel period by the average daily expenditure for each category of anglers.

Angler Expenditures

Angler expenditures were stratified into several categories, including expenditures made by local area anglers, expenditures made locally by non-local anglers, and expenditures made elsewhere in Texas by both local and non-local anglers. Expenditure categories included products and services related to recreational fishing as used in the travel cost method described in a recent study of Sam Rayburn Reservoir, Texas anglers (Anderson et al. 2002). Those categories included transportation, entrance and launch fees, lodging, restaurant and groceries, bait and tackle, fishing guide services, fishing licenses and other trip related expenses. Total direct expenditures were estimated as the total dollar amount spent during fishing trips to and from the tailrace. The estimates for total expenditures were calculated by multiplying the estimated total number of local, non-local and out-of-state angler fishing days for the period of this study by the average daily expenditures for each category (by segment) of anglers (Anderson et al. 2002).

Economic Impact

The primary purpose of conducting economic impact studies is to demonstrate the return on public investment (Crompton 1993). Impact does not refer to those dollars which already exist within the community as those dollars are already circulating locally. Economic impact refers to the expenditures made by out-of-town anglers factored by "multiplier coefficients" of the area economy. Expenditures made by those anglers who live locally should be omitted for purposes of calculating impact (Crompton 2002). When non-local anglers travel to the Comal County area from elsewhere in Texas to fish the tailrace, the area economy exports visitor services and experiences by receiving (importing) those non-local dollars into the economy. The direct impacts of these expenditures are evident as the recipients of these dollars in turn stimulate the secondary rounds of spending as they flow to supplying businesses and subsequently into personal income and tax revenues (Turco and Kelsey 1992). These combined direct and indirect impacts equal the total economic impact of all expenditures made in the area resulting from those non-local anglers.

Multiplier coefficients used in this project were obtained from a similar study of visitors to Guadalupe River State Park in Comal County (Walker, et al 2005). Those

multiplier coefficients were generated through the IMPLAN input-output model (IMpact analysis for PLANning) for Comal County and were used to derive impact estimates for retail sales and personal income. IMPLAN was originally developed by the U.S. Forest Service and is widely used and accepted by the tourism and recreation resources professions (Fedler 1995; Tomas and Crompton 2002).

Consumer Surplus

Economists attempt to estimate the perceived monetary value of resources by determining what people really think the opportunity or experience is worth to them. Consumer surplus is generally defined as the amount of additional dollars an angler would be willing to pay before they would decide not to make a trip to the reservoir to fish (Fedler 1995).

Consumer surplus was estimated in this project by asking each angler (through an open-ended question) to indicate how much more they would be willing to pay above their reported trip costs before they would have canceled their fishing trip to the tailrace. The average consumer's surplus for each segment was then applied to reported expenditures to derive total consumer surplus (Anderson et al. 2002; Hunt and Ditton 1996.

RESULTS and DISCUSSION

Between December 2004 and March 2005, 225 questionnaires were mailed to trout anglers who fished the Canyon Reservoir tailrace. This process resulted in a return of 132 usable questionnaires and five non-deliverable questionnaires, for an effective response rate of 60.0% (Table 1). The precision of estimates for this assessment were calculated from the number of completed survey questionnaires (N = 132). Estimates of proportion such that 0.50 / 0.50 (or 50%) have a corresponding margin of error of +/- 0.0853 (or 8.53%); and for estimates that have a proportion of 0.2 or 0.8 (20% or 80%), there was a corresponding margin of error of +/- 0.0682 (or 6.82%).

Angler Characteristics

Most trout anglers were white (86.7%) males (97.6%), averaging 46.6 years of age, whose household income exceeded $40,000 per year (73.6%) (Tables 2-3). Local anglers spent an average of 1.1 days per trip to fish at the river, and non-local anglers spent an average of 2.9 days per trip during the period of this study. Among all anglers, 62.6% were from outside the Comal County area and traveled an average of 122 miles (one-way) to the river. These characteristics confirm that the Canyon Reservoir tailrace was a destination among trout anglers in Texas.

Anglers indicated that they had been trout fishing the Canyon Reservoir tailrace for an average of 8.3 years and had made on average 5.7 trips to the tailrace since December 1, 2004. Most anglers (78.5%) indicated that a scheduled trout stocking was one of the primary reasons for their trip to the river. A majority of anglers (54.4%) found out about the scheduled stockings through the TPWD Inland Fisheries web page, while others found out through word-of-mouth (16.5%), newspaper (14.6%), TPWD field office (1.9%), fishing clubs (1.9%) or by other means (9.7%). Relatively few anglers (8.5%) were current or recent members of GRTU.

Angler Preferences and Opinions

Angler satisfaction with overall trout fishing at the river was high. The mean score on a 5-point Likert scale was 3.65, where 90.1% of anglers were either moderately to extremely satisfied with trout fishing at the tailrace (Table 4). Angler satisfaction was

also evaluated for their experience at the access site that they used during their recent trip. Camp Huaco Springs (P5), a TPWD leased site, had the highest mean satisfaction score (3.95), where 95% of anglers who used that site were either moderately to extremely satisfied (Table 4). Mean satisfaction scores were similar among the other sites, where the majority of anglers who used each site were either moderately satisfied to extremely satisfied (Table 4).

In addition to perceived satisfaction, anglers were also asked about several qualitative measures at the access site that they used. While most responses were similar among all the access sites, a few differences were observed. Anglers were asked about perceived crowding, and 62.9% of anglers who fished at the Canyon Dam access site (P1) indicated that they felt crowded (Table 5). However, those same anglers also agreed with statements that the Canyon Dam access "had good fishing" (83.3%), "was easy to locate" (98.4%) and gave the "best chance to harvest trout" (92.3%). Results among the other access sites were similar except that access at Whitewater Sports (P2) was not free (66.6%), and that anglers at The Cliffs (P4) indicated that it was not the best chance to harvest trout (57.1%) (Table 5).

Anglers were also asked about their level of agreement with several qualitative statements on trout fishing in general at the tailrace. While anglers agreed with the statement that there were not enough free public access sites at the river (mean = 3.98), they also disagreed that fishing access areas were too crowded and too expensive (Table 6). Anglers also disagreed with the statement that fishing regulations were too restrictive, and agreed that they were easy to understand (Table 6).

Most anglers (68.3%) were not aware that TPWD leased The Cliffs and Camp Huaco Springs to provide free fishing access from December 1, 2004 to March 17, 2005. Anglers were asked if they supported or opposed additional free public access sites on the river. Three-fourths (75.4%) of anglers supported additional free public access sites within the special regulation zone, and 80.5% supported additional free public access sites outside the special regulations zone.

Harvest Regulations

Anglers were asked about their opinions regarding the special harvest regulations. Most anglers (55.5%) reported they had never fished in the special regulation zone.

Among all anglers, 59.3% supported the current regulations inside the special zone, while 72.4% supported the statewide regulations outside the special zone (Table 7).

Bait Type Preferences

Trout caught on live or prepared bait suffer high (31.4%) hooking mortality (Taylor and White 1992). Hooking mortality from using bait in the special regulation zone could negate the effectiveness of a put-grow-and-take regulation. Although live and prepared bait use in the special regulation zone was not prohibited, anglers could not harvest a trout unless it was caught on an artificial lure. Overall tailrace angler bait type preferences in 2004/05 were: live bait (46.3%), combination of live and artificial lures (18.9%) and artificial lures only (34.8%). The high percentage of anglers using live bait or a combination of live and artificial lures was not surprising since most of the angler contacts (91%) were outside the special regulation area where there were no restrictions on bait type. If more anglers were contacted in the special regulation area the percentage of anglers using artificial lures only would have likely increased. At access site P3 (The Cliffs), which was inside the special regulation area, 97.5% of the anglers (N=40) were using artificial lures only.

Angler Catch Rates

Angler catch rate is an important component of overall angler satisfaction (Bohnsack and Ditton 1999). Overall angler catch rate in 2004/05 was 0.76 trout/hour. This catch rate was similar to those reported for other tailrace trout fisheries (Magnelia 2004), but below that from a creel survey conducted in on the Canyon Reservoir tailrace in 1993/94 (1.06 trout/hour) (Magnelia 2004) ($P>0.05$). All three sites surveyed in 1993/94 had very similar catch rates (0.90-0.93 trout/hour) (Magnelia 2004). Angler catch rate between sites in 2004/05 were dissimilar; P1 (0.89 trout/hour), P2 (0.58 trout/hour), P4 (0.71 trout/hour) and P5 (0.63 trout/hour). High reservoir releases during the 2004/05 creel period may have decreased angling effectiveness, thereby decreasing angler catch rate. Catch rates of anglers using artificial lures (CPUE=0.80, SE=0.15) only were almost the same as anglers using live bait only (CPUE=0.81, SE=0.13), and higher than those using a combination of bait types (CPUE=0.55, SE=0.13).

Angler Utilization

The number of anglers fishing for rainbow trout on the Canyon Reservoir tailrace has declined dramatically since the early and mid-1990's (Figure 3). Total tailrace fishing pressure over the 58-day creel period was 7,683 hours (SE=2,693), with 32% of this total (2,449 hours) at the two TPWD lease access sites. In comparison, total fishing pressure in 1993/94 (88 day creel period, 5 stockings) was estimated at 35,570 hours (Magnelia 2004). Mean trip length in 2004/05 (1.96 hours) was also significantly less ($P<.01$) than that documented in 1993/94 (2.56 hours) (TPWD, unpublished data). Total mean angler count at sites P1, P2 and P4 in the 2004/05 creel survey were similar to those in 1999 when the Camp Beans access area was temporarily closed (Figure 3).

Angler counts at all of the traditional sites have generally declined since the mid-90's (Figure 4). The percentage of anglers fishing at sites in the special regulation zone (P3, P4/Beans) has declined, while the percentage of anglers fishing outside the special regulation zone has increased (P1) or remained similar (P2) (Figure 5).

In 2004 flows were extremely high during the creel period (mean daily flow from December 2004 to March 2005 = 1,793 cfs). According to the GRTU web site (www.grtu.org) wading at flows above 550 cfs was considered unsafe. Angling activity at access site P4 was particularly low in 2004 (249 angler hours, 9.2% of total), even though this site offered free access. This free access site offered anglers parking and a path to the river for wade fishing only. There was no bank fishing access. High flows during much of the winter of 2004/05 made wading hazardous and certainly decreased utilization by wade anglers. Camp Beans, which was directly across the river from this site, had bank angling access along approximately 1.6 km of river frontage in addition to being a popular wade fishing area. The permanent loss of this access site in 2002, which accounted for 27% of the trout anglers on the river from 1992-1998 (TPWD, unpublished data), eliminated bank angling opportunity in this portion of the river. Implementation of the special regulation at this site in 1997 also may have changed the type of angler (harvest oriented versus catch-and-release) who would fish this area. In winter 1993/94 the catch-and-release rate was significantly higher at this site than the site directly below the dam, although 37% of the fish caught were harvested (Magnelia 2004). Under the 18-inch minimum length and 1 fish daily bag limit, opportunity for

harvest was certainly reduced at this site. There was a significant decline (ANCOVA model, $P<0.0001$) in angler utilization at all sites after implementation of the trout fishing regulation change in 1997, even though this change didn't apply to all sites and the majority of anglers surveyed in 2004/05 were in support of current tailrace trout fishing regulations. Confusion over the boundaries of the special regulation zone may have decreased the attractiveness of the tailrace for harvest oriented anglers.

The type of access provided by TPWD at Camp Huaco Springs (site P5) was similar to Camp Beans and should have served as an attractive replacement access site. Bank and wade fishing opportunity was excellent, statewide length and bag limits applied and access was free (unlike Camp Beans). Anglers looking for an alternative to the crowded Canyon Dam access site should have also found Camp Huaco Springs attractive. Most anglers fishing this site felt it was uncrowded, unlike the Canyon Dam site where most felt crowded (Table 5). Overall angler satisfaction at this site was the highest of the sites surveyed (Table 4) and it did account for 24% of the angling hours in 2004/05. However, the mean number of anglers utilizing this site (mean anglers = 5.6) was much lower than those documented at Camp Beans from 1992 to 1998 (mean anglers = 16.0). Despite three consecutive years of promotional efforts most anglers (68%) didn't know this free access site was available. The lack of knowledge of this sites availability may have decreased utilization.

Anglers at Camp Huaco Springs also indicated this site was not the best place to harvest trout (Table 5). At the Canyon Dam site most anglers agreed with the statement that it was their best chance to harvest a trout. The perception that harvest opportunities were not as good at this site compared to the Canyon Dam site may have played a role in an anglers decision to visit or re-visit this location. The river is wider at this site than the dam access area (P1), where fish are concentrated in a pool at the fishing pier. Locations where trout concentrate and can be easily caught were not obvious at Camp Huaco Springs. Interestingly, angler catch rate was only slightly lower at Camp Huaco Springs (0.63/hour) than Canyon Dam (0.89/hour) ($P>0.05$). Perhaps the opportunity to easily harvest trout may be a better indicator of angler willingness to visit an access site than having an un-crowded location to fish, even when length and bag limit regulations are identical.

TPWD lease sites accounted for 32% of the fishing pressure in 2004/05. Most anglers (55.5%) that were encountered in the 2004/05 creel survey had never fished in the special regulation zone and most (68.3%) anglers did not know a free TPWD public access site was available in this area. The number of anglers not aware of the leased sites likely would have been much higher, if creel clerks had not informed anglers about these sites availability during interviews. The Cliffs access site (P4) has been leased and promoted annually since 2002 and Camp Huaco Springs (P5) since 2003. It appears promotional efforts to alert anglers of this opportunity have met with limited success. It would seem that after leasing and promoting the same sites for several years anglers would be aware of this opportunity. Interestingly most anglers (54%) found out about trout stockings from the TPWD Inland Fisheries web page, yet information on leased site access availability listed on the same page was apparently overlooked.

Mean flow rate from 1992-1996 (mean flow = 294 cfs) was significantly ($P<0.05$) lower than between 1997-2004 (mean flow = 764 cfs) (Figure 6). These high flows may have decreased the number of anglers wade fishing the river. It appeared there was a relationship between mean angler counts with increased river flow (Figure 7). When flow data was entered into the ANCOVA model as a linear variable there was not a significant relationship. However, when flow data below a threshold value of 600 cfs was transformed to a step function (values < 600 cfs=0) there was a significant inverse relationship noted in the overall model ($P<0.05$). Bettoli and Bohm (1997) found a strong inverse relationship between average daily discharge and estimated fishing pressure on the Clinch River below Norris Reservoir in Tennessee.

Other variables having a significant relationship with angler utilization in the overall ANCOVA model included access site, day of the week, ambient temperature and the number of days since the stocking event. There was not a significant relationship between precipitation and angler utilization, but there was a positive correlation between ambient temperature and angler utilization. At all sites Saturdays had the highest angler utilization when compared with other days of the week. Angler utilization was highest on stocking days and decreased as days post-stocking increased. A significant decrease in the number of anglers in days following stockings was noted in the overall

model (on average 13.6 fewer anglers two days following the stocking). This was most pronounced within a two day period (stocking day and the day after) and then angling activity appeared to decrease at a much lower rate. The stocking day effect was most significant ($P<0.0001$) at the Canyon Dam site (P1) where on average there were 30.5 fewer anglers two days after stocking. Other sites with significant decreases two days post-stocking included: P2 (Whitewater Sports) (-8.6 anglers); and, P4 (Camp Beans/The Cliffs) (-9.4 anglers). Sites P3 (Rio Raft) and P5 (Camp Huaco Springs) did not have significant days post-stocking relationships.

Economic Values

Economic Impact

Direct expenditures resulting from all Canyon Reservoir Tailrace trout anglers were estimated at $126,664 in Texas between December 1, 2004 and March 17, 2005 (Table 8). In terms of local spending, $85,352 of that was spent within the Comal County area. Anglers who traveled from outside the Comal County area spent an average of $24.05 per trip day (Table 9), which generated a total of $86,237 of impact on retail sales to the local economy (Table 10). Furthermore, an estimated $32,278 of impact on personal income was generated from those direct expenditures (Table 10). Based on a total cost of $22,441.81 ($4,900 for leases and $17,541.81 for trout), for every dollar spent on trout and lease access sites by TPWD, $3.93 of economic impact to Comal County was generated.

Economic Value of Lease Access Sites

The lease and stocking of the TPWD access sites generated $4.75 of total economic value for every dollar spent by TPWD. Benefit-to-cost ratios were less at leased sites than non-leased sites (Table 11). Increasing awareness among anglers that these free sites are available would likely increase these ratios. Site P4 (The Cliffs) had the lowest ratio. High flows decreased wade fishing opportunity at this site.

State Revenues

State sales taxes were estimated as a proportion of the direct expenditures among local anglers and as a proportion of the impact from retail sales generated by non-local

anglers and their direct expenditures made elsewhere in Texas. Furthermore, some anglers also reported purchasing fishing licenses during their trip and are estimated separately from state sales taxes on retail purchases. Total state sales taxes were estimated at $6,755 and fishing license sales were estimated at $14,503, generating a combined total of $21,258 in revenues to the State of Texas (Table 12).

Consumer Surplus

The local angler segment indicated that they were willing to pay an additional (mean) 38.0% per trip, whereas the non-local angler segment indicated their willingness to pay an additional (mean) 34.5% per trip (Table 13). This information was subsequently used in calculating the total consumer surplus for recreational fishing at the river. The willingness to pay values were factored with each group's estimated total annual fishing trip days, which resulted in total consumer surplus of $42,728 (Table 13).

Total Economic Value

The total economic value of the Canyon Reservoir tailrace trout fishery was determined by adding total consumer's surplus to overall total direct expenditures for all anglers (Hunt and Ditton 1996). The total annual economic value of the Lower Canyon Reservoir Tailrace trout fishery during the 2004/2005 season was estimated at $164,537 (Table 14). Because persistent high reservoir releases during the survey period decreased wade fishing activity this estimate was probably less than what could be expected during a similar time period with mean flows below 550 cfs.

Another measure of willingness to pay was included based on proposed additional trout stockings being offered. On average, anglers indicated that they would likely make an additional 2.6 trips to the river if one additional trout stocking was made. Based on average per trip expenditures, one additional trout stocking would amount to an additional 2,337 angler trip days, an additional $57,759 in total direct angler expenditures, and an additional $75,029 in total consumer value.

CONCLUSIONS and RECOMMENDATIONS

Results from this study indicated anglers were generally satisfied with their trout fishing experience on the Canyon Reservoir tailrace. However, fishing pressure has decreased since the mid-90's. Increasing the number of trout fishing trips by non-local anglers will increase economic impact to Comal County. Based on factors investigated in this study declines may be largely due to increases in flow since the mid-90's (which has decreased wade fishing opportunity) or the change in fishing regulations on part of the tailrace in 1997. Extremely high reservoir releases during winter 2004/05 most likely contributed to decreased fishing activity among anglers who exclusively wade fish. There were no options for altering reservoir releases for the purpose of increasing utilization. Most anglers supported Tailrace fishing regulations, which offered anglers two different fishing opportunities.

Considerations for increasing utilization included; 1) Promotion of boat fishing float trips between access sites during high flow periods. This would increase accessibility for anglers during winters when high flows persisted. Leasing and promoting access areas specifically designed as put-in and take-out points might encourage this type of utilization. 2) Increase the number of stockings. Publicized stockings were a primary reason anglers visited the tailrace. The total number of trout stocked each winter could remain the same if angler catch rates remained acceptable. The angler catch rate of 0.76 fish/angler hour from the 2004/05 creel survey might be considered a minimum level. 3) Decreasing the time between stockings would likely increase utilization as the greatest number of anglers were encountered within two days of stockings. This was particularly evident at the Canyon Dam access site where 50% of the angling activity was concentrated. 4) Stock on Saturdays or Fridays. Saturday was the most heavily utilized day of the week at all sites. By stocking on Saturdays, the combined effects of day type and the stocking might be realized. If stockings can't occur on Saturdays, Fridays might be considered to keep Saturday within two days of the stocking. 5) Increase the effectiveness of current promotional efforts. While most anglers used the TPWD Inland Fisheries web page to gain information on stockings, most were unaware of free leased site availability. An effort should be made to link web page stocking information with information on leased site availability to increase angler awareness of

these sites. Also, efforts should be made to increase the effectiveness of signage (size, location etc.) at non-leased sites alerting anglers to leased site availability. 6) Make additional free access areas available. Angler expenditures greatly exceeded costs associated with leasing and stocking access sites. Most anglers supported additional free access sites inside and outside the special regulation zone. Anglers supported fishing regulations inside the special regulation zone, yet most had never fished this area. Additional free public access in this area with wade and bank fishing opportunities may increase utilization.

Few anglers were contacted in the special regulation zone in this study. This assessment probably does not reflect the attitudes and opinions of anglers that frequently fish this area. Additional information should be collected in future years when flows are low enough to interview a greater number of anglers wade fishing at The Cliffs lease access area, or other leased areas in the special regulation zone whose opinions may be underrepresented in this study.

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TABLES

Table 1. Canyon Reservoir tailrace angler response rates.

Distributed	Non-deliverable	Respondents	Gross response rate	Effective response rate
225	5	132	58.7%	60.0%

Table 2. Percentage of Canyon Reservoir tailrace trout anglers by race (n = 128).

Race / Ethnicity	Percentage
White	86.7
Black / African American	0.0
Hispanic / Spanish	10.2
Asian / Pacific Islander	0.8
American Indian	1.6
Other	0.8

Table 3. Percentage of trout anglers by gross annual household income (n = 125).

Income category ($)	Percentage
Under 10,000	4.0
10,000 – 19,999	1.6
20,000 – 24,999	5.6
25,000 – 29,999	4.8
30,000 – 34,999	4.8
35,000 – 39,999	5.6
40,000 – 49,999	12.0
50,000 – 74,999	28.8
75,000 – 99,999	14.4
$100,000 or more	18.4

Note: Mean age = 46.6 years.

Table 4. Levels of satisfaction among Canyon Reservoir tailrace anglers (by percent).

Satisfaction with:	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Extremely satisfied	N =	Mean score*
Overall trout fishing at the river	3.8%	6.1%	27.5%	46.6%	16.0%	131	3.65
Canyon Dam access site	1.4%	17.1%	35.7%	28.6%	17.1%	70	3.43
Whitewater Sports access site	0.0%	10.0%	35.0%	50.0%	5.0%	20	3.42
The Cliffs access site	11.1%	22.2%	16.7%	27.8%	22.2%	18	3.27
Camp Huaco access site	0.0%	5.0%	25.0%	40.0%	30.0%	20	3.95

*Mean scores were measured on a 5-point Likert-type scale, with 5.0 = “extremely satisfied” and 1.0 = “not at all satisfied.”

Table 5. Percentage of anglers who agreed with the following statements about the access site that they used during their trip to the tailrace.

	Canyon Dam (n = 71)	Whitewater Sports (n = 20)	The Cliffs (n = 18)	Camp Huaco Springs (n = 20)
It was not crowded	37.1%	88.9%	86.7%	88.9%
The fishing was good	83.3%	64.7%	61.5%	76.5%
It was easy to walk to the water	73.8%	88.9%	85.7%	100.0%
It was easy to locate	98.4%	89.4%	85.7%	88.9%
It was close / convenient to home	70.0%	56.3%	46.2%	64.3%
It was free	86.4%	33.3%	69.2%	94.4%
Best chance to harvest trout	92.3%	62.5%	42.9%	64.3%

Table 6. Angler levels of agreement with the following statements about trout fishing at the Canyon Reservoir tailrace.

Statements	N =	Mean score
Fishing regulations are too restrictive	129	2.16
Fishing regulations are easy to understand	129	3.59
Fishing access areas are too crowded	128	3.60
There are not enough free public access areas available	129	3.98
The cost of trout fishing at the Canyon Reservoir Tailrace is too expensive	129	2.31

*Mean scores were measured on a 5-point Likert-type scale, with 5.0 = “strongly agree” and 1.0 = “strongly disagree.”

Table 7. Angler support of current trout regulations within and outside the special regulations zone (by percent).

Current trout regulations	Support	Neutral	Do NOT support
Inside the special regulation zone (n = 123)	59.3%	26.8%	13.8%
Outside the special regulation zone (n = 127)	72.4%	18.1%	9.4%

Table 8. Total direct angler expenditures at the Canyon Reservoir tailrace during the 2004/05 season. Values represent an estimated 5,126 total angler trip days* during the same period (TPWD 2001), and a non-local ratio of 0.626 (or 62.6%)

Angler Segment	Direct Expenditures Made Locally By	Direct Expenditures Made Elsewhere In Texas By
All Anglers	$85,352	$41,312
Local Anglers	$19,985	$1,858
Non-local Anglers	$65,367**	$39,454

*Total angler trip days were calculated from creel survey results applied by methods described in TPWD 2001.
**Includes $4,900 paid locally (by TPWD) for access leases at Camp Huaco Springs and The Cliffs.

Table 9. Mean trip related expenditures by Canyon Reservoir tailrace anglers during the 2004/05 season.

Angler Segment	Mean Expenditures Per Angler, Per Day Made Locally By	Mean Expenditures Per Angler, Per Day Made Elsewhere In Texas By
Local Anglers	$20.54	$1.91
Non-local Anglers	$14.55	$9.50

Table 10. Direct expenditures and economic impacts made by non-local trout anglers to the Comal County economy during the 2004/05 season.

Expenditure Category	Direct Expenditures	Impact on Retail Sales	Impact on Personal Income
Transportation & fuel	$8,555	$11,814	$3,567
Entrance / access fees	$1,412	$1,980	$928
Lodging	$18,066	$27,930	$9,972
Restaurants	$10,839	$15,630	$5,420
Groceries	$8,638	$11,998	$5,891
Bait & tackle	$5,025	$7,045	$1,889
Guide services	$1,080	$1,514	$710
Fishing licenses*	$5,814	*	*
Other trip expenses	$1,038	$1,455	$682
TPWD access leases**	$4,900	$6,870	$3,219
Sum Total	$65,367	$86,237	$32,278

*Fishing license revenues were paid from retail point-of-sale vendors directly back to the State of Texas.
**Includes $4,900 paid locally (by TPWD) for access leases at Camp Huaco Springs and The Cliffs.

Table 11. Estimated total economic value, cost and benefit-to-cost ratios of trout angler access sites on the Canyon Reservoir tailrace, December 2004 to March 2005 . Sites are identified in figure 1. Costs are for trout only at sites P1 and P2 and for trout and lease access at sites P4 and P5.

Access Site	Percent Fishing Pressure	Estimated Total Economic Value	Cost	Economic Benefit/Cost Ratio
P1	50.7	$83,421	$8,770	9.5
P2	17.4	$28,629	$2,105	13.6
P4	7.6	$12,505	$4,155	3.0
P5	24.3	$39,982	$6,886	5.8

Table 12. State revenues generated by Canyon Reservoir tailrace trout anglers during the 2004/05 season.

Angler Segment	State Sales Taxes Generated by	Fishing License Sales Generated by	Total State Revenues Generated by
Local Area Anglers	$1,365	$8,689	$10,054
Non-local Anglers	$5,390	$5,814	$11,204
Total For All Anglers	$6,755	$14,503	$21,258

Table 13. Angler willingness-to-pay and consumer's surplus for their trip to the Canyon Reservoir tailrace during the 2004/05 season.

Angler Segment	Willingness-to-pay More Per Trip (mean)	Total Annual Consumer's Surplus	Total Annual Consumer Value
Local Anglers	38.0%	$8,300	$30,143
Non-local Anglers	34.5%	$34,428	$134,394
Total For All Anglers	---	$42,728	$164,537

FIGURES

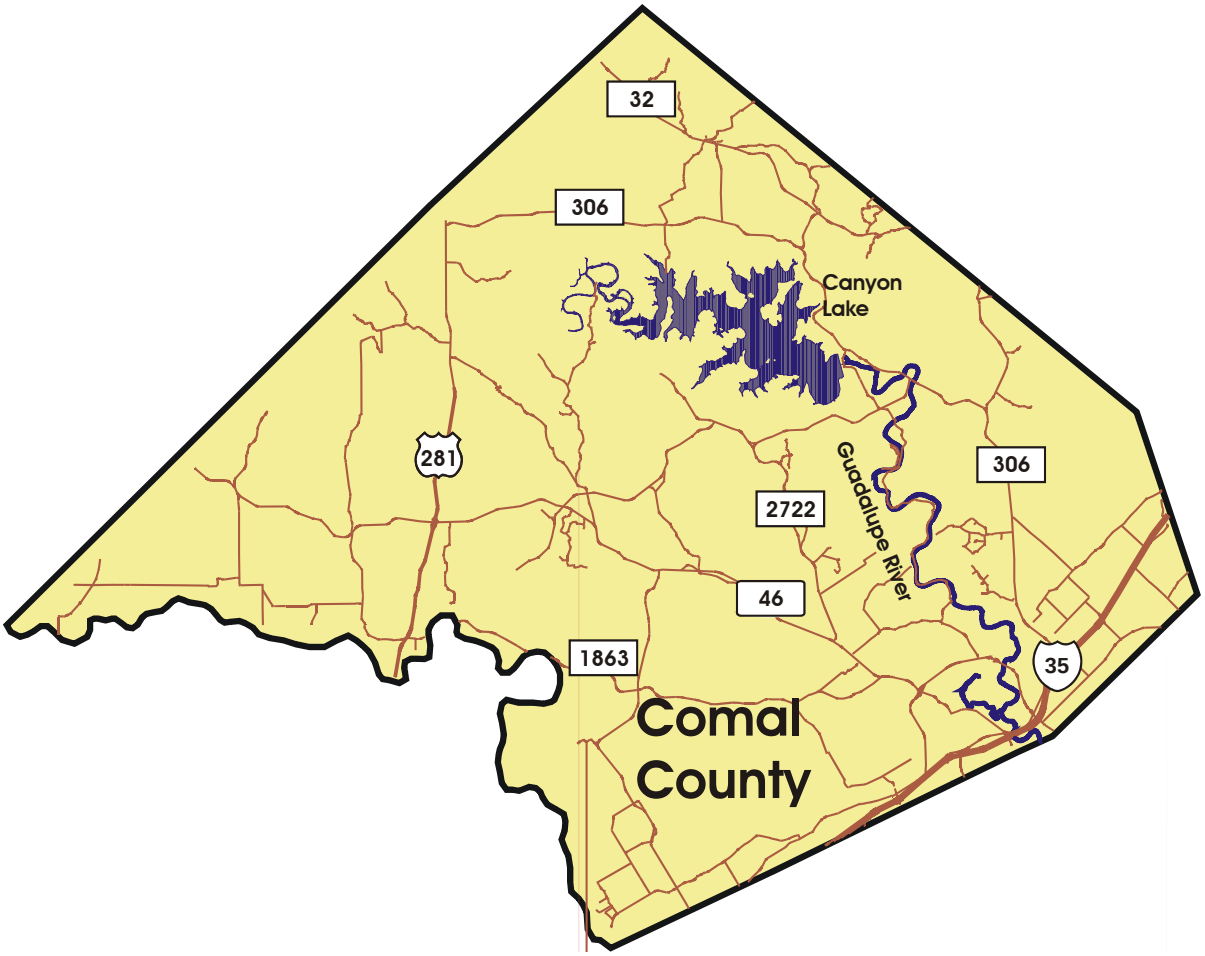


Figure 1. Comal County, Texas.

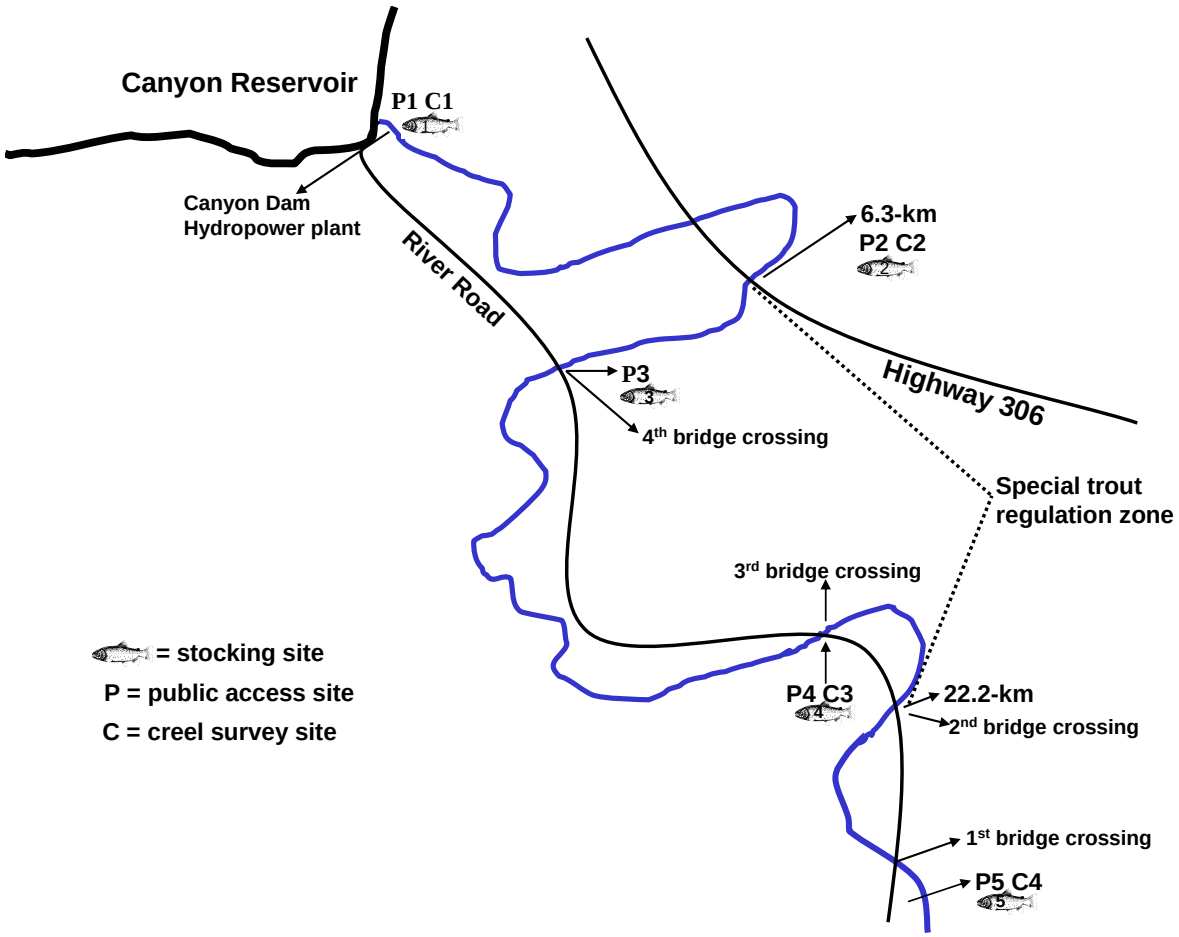


Figure 2. Public access, trout stocking and creel survey sites on the Canyon Reservoir tailrace, December 2004 to March 2005. The Cliffs (Site P4) and Camp Huaco Springs (Site P5) were leased by TPWD for angler access. Map is not to scale.

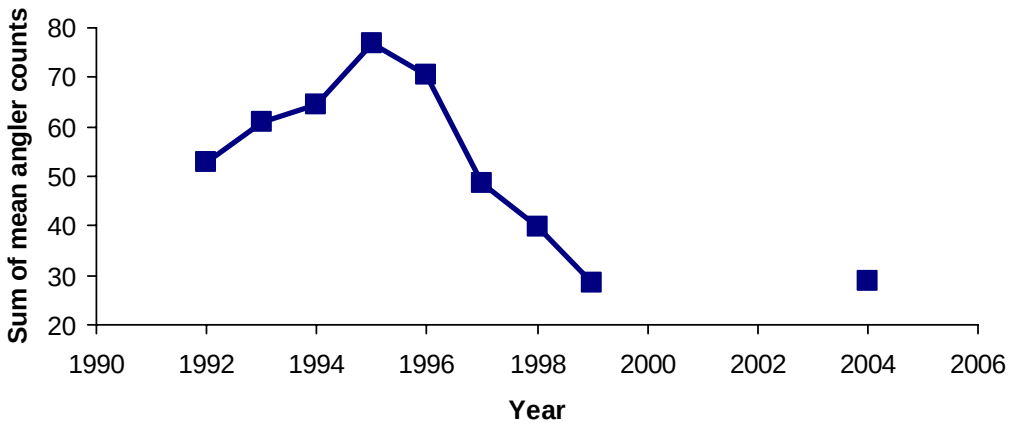


Figure 3. Sum of mean angler counts from access sites P1, P2 and Camp Beans from 1992-1998; P1, P2 in 1999; and sites P1, P2 and P4 in 2004. All counts were taken from December through February. Access sites are identified in figure 1.

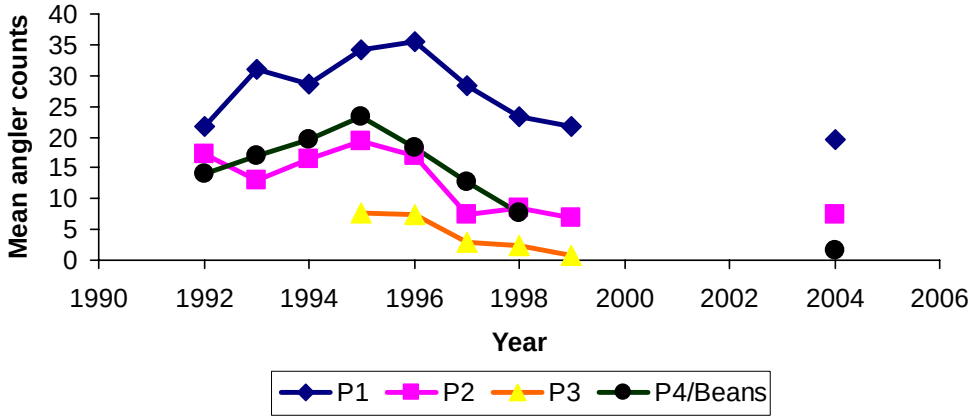


Figure 4. Mean angler counts from access sites P1, P2 from 1992-1999, P3 from 1995-1999, Camp Beans 1992-1998 and sites P1, P2 and P4 in 2004. Access sites are identified in figure 1.

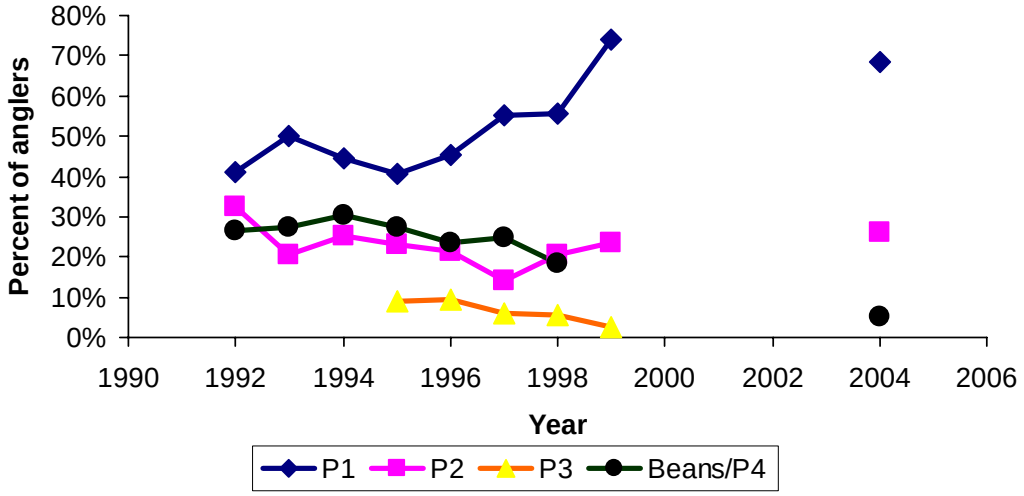


Figure 5. Percentage of anglers at access sites P1, P2 from 1992-1999, Camp Beans 1992-1998 and sites P1, P2 and P3 in 2004. Access sites are identified in figure 1. Site P3 was not surveyed in 2004.

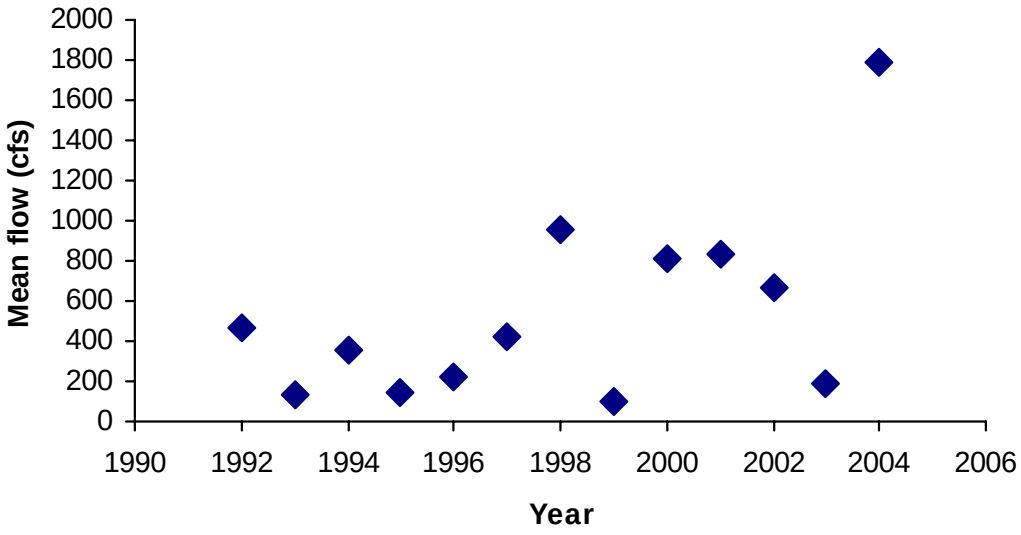


Figure 6. Mean flow (cfs) from December 1 to February 28, 1992-2004.

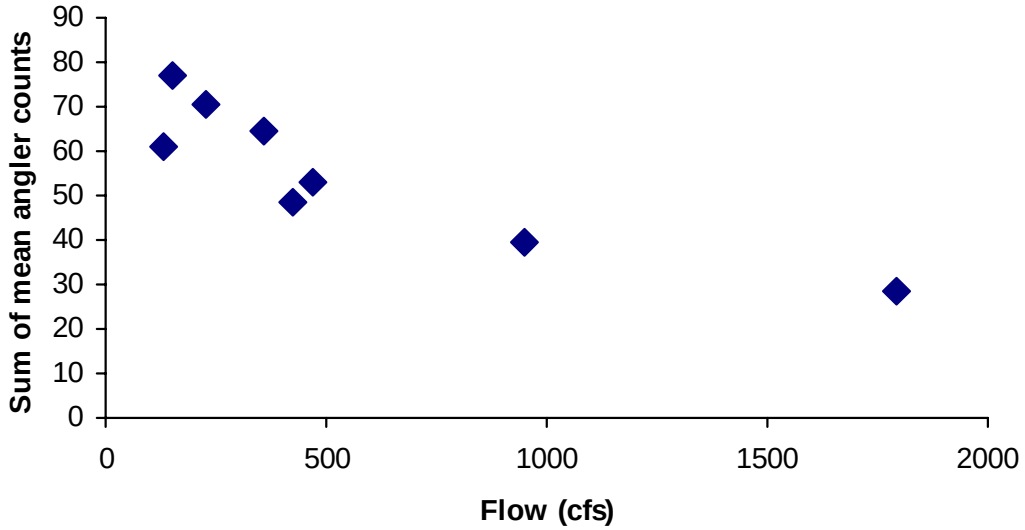


Figure 7. Mean flow (cfs) from December 1 to February 28 1992-1998 and 2004, and sum of mean angler counts on the Canyon Reservoir tailrace.

APPENDICES

Appendix A: Survey Instrument used for gathering information from Canyon Reservoir tailrace trout anglers.

March 1, 2005

Dear _____:

The Texas Parks & Wildlife Department is conducting a survey of people who trout fish on the Guadalupe River below Canyon Dam. During a recent fishing trip to the river, you were asked by one of our Inland Fisheries staff to participate in this study.

The purpose of this study is to determine the attitudes, opinions, management preferences and expenditure patterns of anglers who trout fish this area of the Guadalupe River. Results of this study will be used to inform decision makers regarding the trout fishery and stockings, as well as public access locations at the river.

This questionnaire has only been issued to a sample of Guadalupe River trout anglers; therefore, your participation is extremely important to the completion of this study. Your answers will not be connected with your name and any information you provide will remain strictly confidential. Please take the time to complete the questionnaire and return it in the enclosed postage-paid envelope. If you should have any questions, please contact us by mail, e-mail or phone using information provided on the final page of the survey. Thanks, and good fishing!

Sincerely,

Phil Durocher
Director, Inland Fisheries

For the following questions, please tell us about your typical trout fishing experiences at the Guadalupe River below Canyon Dam.

1. How many years have you been trout fishing at the Guadalupe River below Canyon Dam?
_____Years

2. How many trout fishing trips have you made to the Guadalupe River below Canyon Dam **since December 1, 2004?**
_____ trips

3. Was a scheduled trout stocking one of the primary reasons for your recent fishing trip to the river?

1. YES 2. NO (circle one)

IF YES, how did you find out about the **stocking**? (check one)

	Word of mouth		Chamber of Commerce
	TPWD website		TPWD field office
	Newspaper		Radio
	TPWD Magazine		Fishing club / organization
	Other magazine		Other (write in):

4. If the Department offered one additional trout stocking per year, how many more trout fishing trips would you make to the river per year?
_____ more trips per year

5. Please indicate below how satisfied you are with trout fishing at the Guadalupe River below Canyon Dam. (Circle your answers)

Satisfaction with:	Not at all Satisfied	Slightly Satisfied	Moderately Satisfied	Very Satisfied	Extremely Satisfied
Overall trout fishing at the river	1	2	3	4	5
The access site location you used	1	2	3	4	5

6. Are you a current or recent member of the Guadalupe River Trout Unlimited Chapter?

1. YES 2. NO (circle one)

Currently, there are special harvest regulations for trout on the Guadalupe River from the eastern-most bridge crossing on Highway 306 to the 2nd bridge crossing on River Road. In this area, there is an 18-inch minimum length limit and one fish daily bag on rainbow and brown trout. Furthermore, only trout caught on an artificial lure may be kept, although live or prepared bait may be used in this zone if all trout are released. The following questions will help us understand more about your attitudes toward this special regulation.

7. Have you ever fished in the special zone before? 1. YES 2. NO (circle one)

8. Among the scenarios below, please indicate your preferred harvest regulations for rainbow and brown trout at the Guadalupe River below Canyon Reservoir. (check appropriate boxes)

Current trout regulations	Support	Neutral	Do NOT support
Inside the special regulation zone (described above)			
Outside the special regulation zone (statewide trout regulations: 5 fish daily bag, no length limit)			

In years of drought, there is not enough cold water released from Canyon Dam to sustain the trout fishery in the lower part of the river. Although the water is cold, it warms quickly due to the reduced flow of water being released. During those drought periods, water temperature is only sufficient for year-round trout survival from Canyon Dam to the Whitewater Sports location.

9. Would you support or oppose extending the current special regulation zone closer to the dam in order to protect trout from harvest during these warmer water conditions? (circle one)

Strongly oppose	Oppose	Neutral	Support	Strongly support
1	2	3	4	5

10. Please indicate below if you agree or disagree with the following statements regarding trout fishing at the Guadalupe River below Canyon Dam. (Circle your answers)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Fishing regulations are too restrictive	1	2	3	4	5
Fishing regulations are easy to understand	1	2	3	4	5
Fishing access areas are too crowded	1	2	3	4	5
There are not enough free public access areas available	1	2	3	4	5
The cost of trout fishing at the Canyon Reservoir Tailrace is too expensive	1	2	3	4	5

You were asked to participate in this survey during a recent fishing trip to the Guadalupe River below Canyon Dam. Please answer the following questions with your most recent fishing trip to the river in mind.

11. How many days were you away from your home (round-trip) during this trip to the river?

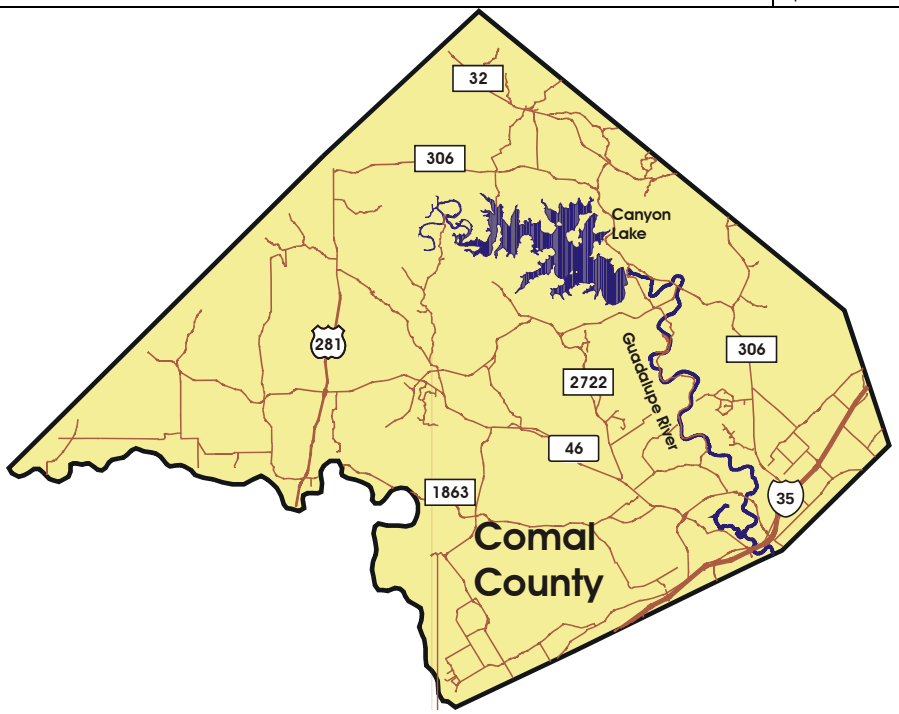
_____ Days

12. How far did you travel (ONE WAY) for this trip to the river? _____ Miles

13. How many people (including yourself) are in your **immediate group** (those with whom you are personally traveling with today, such as family or close friends)? _____ People

14. On that entire trip to the river, how much did you or your immediate group spend on each of the following items?

	In the Comal County area **(See map to the right)**	Elsewhere in Texas
Auto transportation (such as fuel or repair)	$	$
Other transportation (such as airfares)	$	$
Boat rental	$	$
Boat operation (such as fuel, oil, or servicing)	$	$
Boat launch fees	$	$
Entrance or parking fees	$	$
Lodging (such as hotels or camping fees)	$	$
Restaurant meals	$	$
Groceries (such as food, drink or ice)	$	$
Bait and tackle (purchased during this trip)	$	$
Fishing guide fees	$	$
Fishing license	$	$
Other expenses on this trip (please list below)	$	$
If you traveled from outside Texas on this trip, how much did you spend while **outside** Texas but for the purposes of this fishing trip?		Outside Texas: $



15. If you knew the prices of goods and services were to increase so this particular trip cost **more**, how much more (by percentage) would you have paid before you would have **canceled** your trip? (check one box)

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	More than 100%

16. During your recent trip to the river, you were contacted by one of our staff. Which one of the following locations were you contacted at? (Check only one)

Canyon Dam	Whitewater Sports	The Cliffs	Camp Huaco

17. Please indicate below the reasons for choosing the access site that you used (from the previous question). (Check all that apply)

	Agree	Disagree
It was not crowded		
The fishing was good		
It was easy to walk to the water		
It was easy to locate		
It was close / convenient to my home		
It was free		
Best chance to harvest trout (take home)		
Other (please write in):		

18. How did you find out about that access site? (check one)

	Word of mouth		Chamber of Commerce
	TPWD website		TPWD field office
	Newspaper		Radio
	TPWD Magazine		Fishing club / organization
	Other magazine		Other (write in):

19. Before this survey, were you aware that the Texas Parks & Wildlife Department leased The Cliffs and Camp Huaco to provide free fishing access from December 17, 2004 to March 17, 2005?

1. YES 2. NO (circle one)

20. Would you support or oppose additional free public access sites on the river? (please check)

River area:	Oppose	Neutral	Support
Inside the special regulation zone			
Outside the special regulation zone			

21. Are you aware of other free access location for trout fishing on the Guadalupe River below Canyon Dam?

1. YES 2. NO (circle one)

22. Are you?

1 White
2 Black
3 Spanish / Hispanic
4 Asian
5 American Indian, Eskimo, or Aleut
6 Multi-racial
7 Other *(Please specify)*: _____

23. Are you? (Circle one). 1 Male 2 Female

24. What is your age? _____ Years

25. What is your approximate annual household income before taxes? (Circle one).

1	Under $10,000	6	$35,000-$39,999
2	$10,000-$19,999	7	$40,000-49,999
3	$20,000-$24,999	8	$50,000-$74,999
4	$25,000-$29,999	9	$75,000-99,999
5	$30,000-$34,999	10	$100,000 or more

26. What improvements could be made (if any) to influence you to make more trout fishing trips to the Guadalupe River below Canyon Reservoir? (Please explain)

Appendix B: News release used for promotion of leased angler access sites on the Canyon Reservoir tailrace January, 2005.

TPWD Contact: Steve Magnelia or Craig Bonds, Texas Parks and Wildlife Department (TPWD) Fisheries Biologists, San Marcos, (512) 353-0072

01/05/05

Free Canyon Reservoir Tailrace Trout Angler Access Available at The Cliffs and Camp Huaco Springs

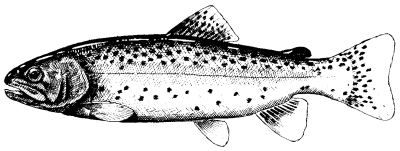
Free trout fishing access is available on the Canyon Reservoir tailrace below Canyon Lake until March 17, 2005 at two sites leased by the Inland Fisheries Division of the Texas Parks and Wildlife Department (TPWD). The Cliffs access site is located just past the third bridge crossing on River Road. This access site offers parking and wade fishing access via a marked path to the river. There is no bank fishing access at this site. Wade fishing is advised only at river flows below 500 cfs. The current Canyon Reservoir Tailrace flow rate may be found on the internet at http://waterdata.usgs.gov/tx/nwis/uv?format=pre&period=0&site_no=08167800 The second access site, Camp Huaco Springs, is located just below the first bridge crossing on River Road. This site offers approximately a mile of bank access, as well as good wade fishing opportunities. In order for the daily access fee to be waived at this site anglers must park in the designated parking area and walk to the river. The Texas Parks and Wildlife Department stocks trout at both these sites. Camp Huaco Springs receives about 25% of all the trout stocked by the Department on the Canyon Reservoir Tailrace. River Road runs along the Canyon Reservoir Tailrace from New Braunfels to Sattler, TX.

Trout stockings are slated for January 7, January 21 and February 11, 2005. Additional Canyon Reservoir tailrace trout stocking sites include the fishing pier directly below Canyon Dam (free access), Whitewater Sports on HWY 306 (fee charged) and the bridge crossing in Sattler (fee charged by Rio Raft Company). Anglers should consult the 2004/2005 TPWD Outdoor Annual for specific trout fishing regulations on the Canyon Reservoir Tailrace.

Additional information on Texas winter trout stockings may be found on the TPWD Inland Fisheries Division web page (http://www.tpwd.state.tx.us/fish/infish/reports/trout_stocking.phtml).

Appendix C: Promotional signage posted at angler access sites on the Canyon Reservoir tailrace during December 2004 to March 2005. Signage had dimensions of 21.6 x 27.9 cm.

TEXAS PARKS & WILDLIFE



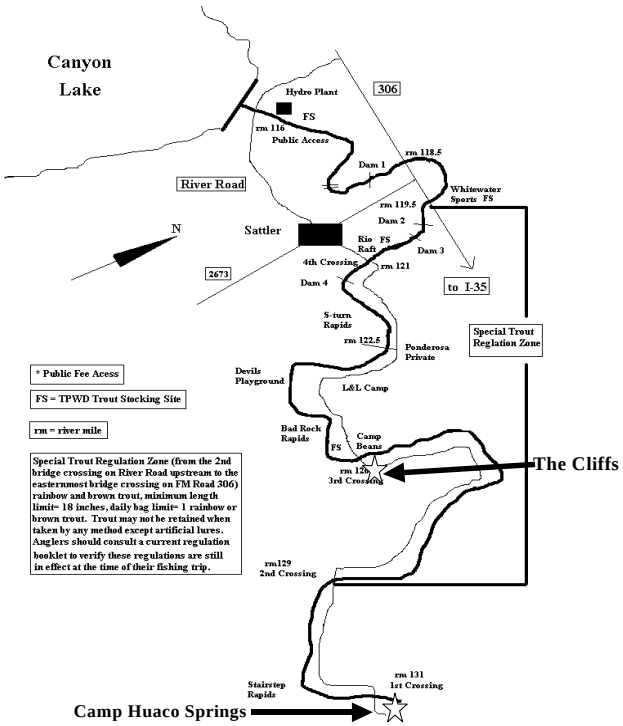
SPORT FISH RESTORATION

2004-2005 **NO FEE** TROUT FISHING SITES

1) **Corp of Engineers property directly below Canyon Dam.**

2) **The Cliffs (parking areas just below the third bridge crossing on River Road on the south side of road – wade fishing only) – Free fishing access December 29, 2004 to March 17, 2005**

3) **Camp Huaco (directly below 1st bridge crossing – wade and bank fishing) – Free fishing access December 29, 2004 to March 17, 2005**



Appendix D: Creel survey statistics from the Canyon Reservoir tailrace, Comal County, Texas, December 31, 2004 to February 26, 2005. Standard errors are included in parenthesis. Sites are identified in figure 2.

Site	P1	P2	P4	P5	Total
Total Effort (hrs)	3,893 (1,290)	1,341 (523)	581 (249)	1,868 (631)	7,683 (2,693)
Number Stocked	8,859	2,126	1,773	4,430	17,719
Number Caught	2,934 (1,131)	844 (527)	388 (243)	1,464 (758)	5,630 (2,659)
Percent Return(C)1	33.1	39.7	21.9	33.0	31.8
Number Harvested	2,486 (987)	823 (523)	0	833 (489)	4,142 (1,999)
Percent Return(H)2	28.1	38.7	0	18.8	23.4
Number Released	448 (286)	21 (19)	388 (243)	631 (387)	1,488 (935)
Percent Released	16.6	2.5	100	43	26.4
Catch Rate	0.89 (0.13)	0.58 (0.16)	0.71 (0.29)	0.63 (0.15)	0.76 (0.08)
Catch Rate(S)3	1.36 (0.25)	0.45 (0.14)	0.27 (0.27)	0.70 (0.22)	1.03 (0.16)
Catch Rate(WE)4	0.61 (0.15)	0.45 (0.17)	0.84 (0.38)	0.36 (0.16)	0.55 (0.10)
Catch Rate(WD)5	0.27 (0.21)	1.61 (1.78)	0.41 (0.41)	1.35 (0.53)	0.87 (0.28)

[1] The percentage of stocked fish caught
[2] The percentage of stocked fish harvested
[3] Number of trout caught/hour on stocking days
[4] Number of trout caught/hour on weekends
[5] Number of trout caught/hour on week days

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