

Cost/Benefit of Stocking Trout in a Small Texas Impoundment

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Abstract: Winter stockings of rainbow trout (*Salmo gairdneri*) in a small (26.3 ha) state park lake were evaluated to determine cost effectiveness of this fishery management technique. A creel survey was conducted to measure fishing pressure and harvest. benefits, in terms of increased hours of fishing provided, increased weight of fish harvested, and increased park entrance revenue, were substantially higher than the cost of stocking.

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The Inland Fisheries Branch of Texas Parks and Wildlife Department (TPWD) is responsible for management of all public freshwaters in the state. With expanding populations, especially in urban areas, resource managers constantly strive to increase recreational opportunities utilizing existing facilities. Introduction of fishes to utilize niches not being filled by native species is one method of accomplishing this goal. Successes with white bass X striped bass hybrids (*Morone chrysops* X *M. saxatilis*) and Florida largemouth bass (*Micropetrus salmoides floridanus*) showed managers that fishing opportunities could be improved without detracting from existing fisheries.

These unused or underutilized niches can exist in respect to time as well as environment. Managers discovered that fisheries could be established for cold water species at times of the year when utilization of warm water species were traditionally low. Rainbow trout (*Salmo gairdneri*) have been stocked in cold tailrace waters below deep storage reservoirs in Texas since 1966 (White 1968). Although these introductions may be possible biologically, they may still prove impractical if anglers will not utilize them, or if their cost-effectiveness is low. Otherwise, money spent to stock trout might be better spent on other programs. Angler acceptance and cost-effectiveness of catchable trout fisheries in tailrace areas have been proven in Texas (Forshage 1976). This study was conducted to evaluate angler acceptance and cost effectiveness of a put and take rainbow trout fishery in a small public impoundment.

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Methods

The study was conducted on a small (26.3 ha) impoundment within the boundaries of Tyler State Park, 14.5 km north of Tyler in Smith County, Texas. The lake is owned and managed by the TPWD to provide fishing, boating, and swimming for an estimated 412,000 annual visitors. The lake is very clear and provides a limited fishery for largemouth bass (*M. salmoides*), channel catfish (*Ictalurus punctatus*), and sunfishes (*Lepomis sp.*). Rainbow trout were first stocked 30 November 1983 and stocking continued biweekly through February 1984. (Table 1). Anglers were permitted to harvest 5 trout per day with no minimum size. All trout were stocked at the boat ramp adjacent to the creel station.

Creel surveys were conducted on 4 weekdays and 6 weekend days selected randomly from 1 January 1984 through 31 March 1984. Creel surveys consisted of instantaneous angler counts (for pressure estimates) and angler interviews (for harvest estimates and species sought). Instantaneous angler counts were conducted twice a day at times selected at random. Creel clerks counted anglers from a central observation point with the aid of binoculars. Interviews were conducted from sunrise to sunset at one location adjacent to the boat ramp. All fishermen returning to the creel station at the completion of their fishing trip were interviewed. In addition, anglers not parking at this area were requested to return to the creel station to be interviewed before leaving the park. Number of anglers per party, hours fished, species sought, and number of trout caught were recorded. Average lengths and weights of trout were obtained prior to stocking with the assumption that they would be caught before a substantial change in size. Numbers and weights of all other species caught were recorded for comparison. Boat and bank anglers were recorded separately, but

Table 1. Rainbow trout stocking schedule, Tyler State Park Lake, 1983-1984 season.

Date	N Stocked	N per ha	Cumulative % Stocked	Average Length (mm)
30 Nov 83	1,490	56.5	14.9	193
14 Dec 83	1,563	59.4	30.6	229
04 Jan 84	1,683	64.0	47.5	229
18 Jan 84	1,500	57.0	62.6	220
01 Feb 84	1,116	42.4	73.7	229
15 Feb 84	1,578	60.0	89.6	229
29 Feb 84	1,037	39.4	100.0	254
Totals	9,967	379.0	—	n/a

were given equal weights when calculating average catch per hour. Data were expanded to provide estimates of fishing effort and harvest for selected species during the period 1 December 1983 through 31 March 1984.

Cost was defined as the total monetary outlay by TPWD to provide the fishery. As the park would have operated regardless of whether the fishery existed or not, only the additional cost of purchasing, holding, feeding, and stocking the trout were used. The estimated cost per trout was \$0.58, (Pat Hutson, pers. commun., TPWD, San Marcos, Texas).

Benefits of the newly established trout fishery were measured as: increase in hours fished, increase in weight of fish harvested, and increase in park entrance revenues. Increase in hours fished was determined by using only those hours directed toward fishing for trout. This value was expanded by \$4.82, the Texas average expenditure per angler hour (U.S. Dep. Int. 1982). It was assumed that this value was equal to the gross market worth. Commercial worth of fish harvested was determined by expanding the weight of trout harvested by the commercial value of rainbow trout (\$6.59/kg, obtained from several area supermarkets). Increases in park revenues (money collected for day use and camping fees) were obtained from park officials. Values for increased hours fished, increased weight of fish harvested, and increased park receipts were summed to determine dollar benefits provided by trout stocking.

Results and Discussion

Anglers accepted the new fishery as demonstrated by an estimated 7,413 anglers fishing 17,008 hours during the study period (Table 2). Effort specifically for trout was 14,169 hours and accounted for 83% of the total. Only 1% of the anglers were fishing for bass or sunfish; the remaining 16% did not identify a target species (Table 3). Average estimated trip time per angler was 2.3 hours. Forshage (1976) reported an average of 2.7 hours per trip for the Brazos River trout fishery while Wollitz and Jessie (1970) reported an average of 2.7 hours per trip for trout anglers in Virginia.

Catch per unit effort (CPUE) for trout was 0.40 per hour or 1 trout for each 2.5 man-hour of fishing. This is considerably higher than the 0.17 reported by Forshage (1976) for the Brazos River fishery and 0.33 reported by Jones (1982) for Laurel

Table 2. Sport fishing pressure estimates for Tyler State Park Lake, December 1, 1983 through March 31, 1984. Standard errors are in parentheses.

<i>N</i> Parties	3,758 (485)
<i>N</i> Anglers	7,413 (871)
Angler-hours	17,008 (1,867)
Angler-hours/ha	647 (71)
Average hours/Angler-trip	2.3 (0.09)

Table 3. Sport fishing harvest estimates by species for Tyler State Park Lake, December 1, 1983, through March 31, 1984. Standard errors are in parentheses.

	Rainbow trout	Largemouth bass	Sunfish	Anything
N Fish	6,848 (2,096)	198 (198)	207 (142)	—
Weight (kg)	1,554.0 (475.8)	80.7 (60.6)	21.9 (12.5)	—
Fish/hour	0.40 (0.155)	0.01 (0.012)	0.01 (0.008)	—
Kg/hour	0.09 (0.035)	0.01 (0.005)	0.01 (0.001)	—
Fish/ha	260.3 (79.7)	7.5 (5.6)	7.8 (4.0)	
Kg/ha	59.1 (18.1)	3.0 (2.3)	0.8 (0.5)	
Hours				
Seeking	14,169 (2,284)	99 (51)	51 (64)	2,869 (1,707)
% Hours Seeking	83.3 (9.9)	0.6 (0.3)	0.3 (0.4)	15.8 (9.9)

Lake, Kentucky, but slightly below the 0.60 per hour reported for California lakes (Butler and Borgenson 1965). The relatively high CPUE may be partially responsible for the excellent acceptance of the fishery. Texas anglers statewide averaged 0.51 fish per hour for all species combined in 1983, and this rate was in line with their expectations. Anglers at the park harvested an estimated 7,252 fish weighing 1,657 kg during the 4-month period. Rainbow trout comprised 95% by number and 94% by weight of this total or 6,848 fish and 1,554 kg respectively. Other species harvested were largemouth bass and sunfish. Recovery rate of 9,967 stocked trout was 69%, comparing favorably with the tailrace fishery in the Brazos River which had a 51% recovery rate (Forshage 1976). Rates of recovery in other states range from 10% in Laurel River Lake, Kentucky (Jones 1982), to 95% below Bull Shoals Dam in Arkansas (Axon 1975). Fisheries managers in California consider a 50% recovery rate successful in their catchable trout fisheries (Anderson 1972).

Total park visitation increased compared to the same period from the previous winter by 341 people in December, 26,669 in January, and 7,466 in February (Table 4). This trend of increasing angler participation during the stocking period is similar to results reported by California researchers (Anderson 1972). Anderson further noted participation continued to increase in later years as more anglers became aware of the program.

This program was successful in terms of cost effectiveness. Total cost to provide the trout fishery was \$5,780.00 (\$0.58 per fish for the 9,967 stocked, Table 5). Gross market worth of the recreational fishery was calculated to be \$68,285.00 (14,168 man-hours directed toward the trout multiplied by the average of \$4.82 per man-hour). Total market value of the harvested trout was calculated to be \$10,083.00 (1,530 kg harvested at a market value of \$6.59 per kg). Increase in park revenue over the year prior to stocking was \$7,184.00 and was in itself more than enough to purchase the trout. Total generated revenue from the program including recreation, harvest, and increased park receipts was \$85,555.00. The resulting cost-to-benefit ratio was 1:15, or a 1,500% return on the initial investment of \$5,781.00. This

Table 4. Values of park visitation and revenue during the trout stocking program compared to the same season the year prior to stocking. Dollar figure in parenthesis.

	<i>Park Visitation</i>		Monthly Change
	1982-83 Season	1983-84 Season	
<i>Day Use:</i>			
Dec	8,532 (\$520)	8,569 (\$798)	+ 67 (\$278)
Jan	9,045 (\$852)	11,828 (\$2,228)	+ 2,783 (\$1,376)
Feb	11,466 (\$1,040)	17,574 (\$2,114)	+ 6,108 (\$1,074)
Mar	24,809 (\$3,014)	26,653 (\$2,824)	- 1,844 (\$190)
		<i>Day Use Total</i>	+10,802 (\$2,538)
<i>Overnight:</i>			
Dec	1,269 (\$2,625)	1,543 (\$2,984)	+ 274 (\$358)
Jan	1,158 (\$2,633)	1,044 (\$2,540)	- 114 (\$123)
Feb	1,449 (\$3,103)	2,807 (\$5,645)	+ 1,358 (\$2,542)
Mar	6,694 (\$12,269)	7,792 (\$14,137)	+ 1,098 (\$1,868)
		<i>Overnight Total</i>	+ 2,616 (\$4,646)
		<i>Totals</i>	+13,418 (\$7,184)

compares favorably to the 1:28 reported by Forshage (1976) for the Brazos River fishery. It is likely that the 1:15 ratio is an underestimate because inflation has likely increased the cost per angler hour since 1980. As the winter fishery for native warm water species at the park is poor this program provided additional benefits by providing anglers an opportunity to catch fish during a period of the year when they might otherwise not fish. Many anglers stated during interviews that they had fished in some of the tailwater fisheries in Texas and appreciated a trout fishery closer to home. All anglers interviewed felt this was an effective program and expressed the wish that it be continued. As more anglers become aware of this fishery, its popu-

Table 5. Costs and benefits associated with the rainbow trout fishery at Tyler State Park Lake, 1 December 1983, through 31 March 1984.

<i>Cost to Provide Fishery:</i>	
1. \$0.58 per trout × 9,967 trout stocked	\$ 5,781
<i>Financial Benefits Attributable to Fishery:</i>	
1. 14,168 angler-hour seeking trout × \$4.82 average expenditure per angler- hour	\$68,288
2. 1,530 kg trout harvested × \$6.59 local cost per kg of trout	\$10,083
3. Increase in park revenue over year prior to trout stocking	\$ 7,184
	<u> </u>
	Total + \$85,555
<i>Cost-to-Benefit:</i>	
\$5,781/\$85,555 = 1:15	

larity is expected to increase. We will recommend expanding this program to other lakes within the state park system because angler acceptance was so good and benefit-to-cost ratio so high.

Literature Cited

- Anderson, K. R. 1972. Russian River catchable sized trout stocking program: results of the 1970–1971 study. *Inland Fish. Adm. Rep.* 72–8. *Resourc. Agency Calif. Dep. Fish and Game.* 19pp.
- Axon, J. R. 1975. Review of coldwater fish management in tailwaters. *Proc. Annu. Conf. Southeast. Assoc. Game and Fish Comm.* 28:351–354.
- Butler, R. L. and D. P. Borgenson. 1965. California “catchable” trout fisheries. *Fish Bul.* 127. *Resourc Agency Calif. Dep. Fish and Game.* 47pp.
- and ———. 1966. “Catchable” trout fisheries. Pages 184–186. *in* A. Calhoun, *Inland Fisheries Management.* *Resourc. Agency Calif. Dep. Fish and Game.*
- Forshage, A. 1975. Cost-to-benefit analysis of a catchable rainbow trout fishery in Texas. *Proc. Annu. Conf. Southeast. Assoc. Game and Fish Comm.* 29:293–300.
- Jones, A. R. 1982. The two story trout fishery at Laurel River Lake, Kentucky. *North Am. J. Fish. Manage.* 2: 132–137.
- Nielson, L. A., W. T. Kendall, and L. A. Helfrich. 1981. Comparison of angler use and characteristics at three catchable trout fisheries in Virginia. *Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies.* 34:330–340.
- U.S. Department of the Interior. 1982. 1980 National survey of fishing, hunting, and wildlife associated recreation—Texas. U.S. Dep. Int., Fish and Wildl. Serv. and U.S. Dep. Commerce, Bur. Census, U.S. Gov. Printing Off., Washington, D.C. 76pp.
- White, R. L. 1968. Evaluation of catchable rainbow trout fishery. *Texas Parks and Wildl. Dep., D. J. Prog. Rep. Job E-9, Proj. F-2-R,* 24pp.
- Wollitz, R. E. and J. H. Jessie. 1970. Notes on the trout fishery of Hidden Valley Lake, a coldwater impoundment in southwest Virginia. *Proc. Annu. Conf. Southeast. Assoc. of Game and Fish Comm.* 23:576–586.