Case Histories of Three Walleye Stocking Techniques with Cost-to-Benefit Considerations

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Abstract: Cost:benefit of 3 walleye fisheries were evaluated in 3 Texas reservoirs. Costs to establish walleye fisheries included expenses for equipment and for labor to procure and hatch eggs, to rear fry or fingerlings, and to stock reservoirs. Benefits of walleye fisheries were determined by multiplying the monetary value of a man-hour of recreational fishing by number of man-hours of walleye fishing as determined by creel surveys. At Meredith Reservoir, where low densities of fry were stocked as the lake initially filled, cost-to-benefit of 1:89 was achieved in 3 years. At Greenbelt Reservoir, where fingerlings were stocked at low densities into an established fish community, it took 7 years to achieve a cost-to-benefit of only 1:21. At White River, a reservoir which also had an established fish community, mass stocking (introducing large numbers of frys) achieved a cost-to-benefit of 1:42 in only 2 years. The technique of mass fry stocking is recommended for Texas waters because in this study it resulted in establishing a walleye fishery more quickly and more cost effectively than fingerling stockings, particularly in reservoirs with established fish communities and those where limited walleye reproduction is expected.

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The walleye (*Stizostedion vitreum vitreum*) was one of the first open water sport fishes introduced into Texas reservoirs to utilize overabundant forage fishes in an effort to prolong or improve quality fishing. They were first stocked in Texas in 1953 (Toole 1953) but these introductions failed. Walleye introductions began in 1965 (Peters 1965, Smith 1965) and now have been made in 61 reservoirs throughout the state by stocking fry or fingerlings

in established and newly impounded reservoirs. However, successful walleye fisheries developed only in those reservoirs where high population densities occurred as a result of natural reproduction or through sufficient stocking (Prentice 1977).

In other states, walleye fisheries have been established in reservoirs with existing fish communities by introducing large numbers of fry, creating dense walleye populations without reproduction necessarily occurring (Puttman and Weber 1980, Forney 1975). This technique, called mass stocking, has been used in Texas with favorable results. This study analyzes the case histories of 3 successful walleye fisheries and evaluates relative cost-to-benefit of fry and fingerling stocking.

Description of Study Area

Meredith Reservoir, located 60 km north of Amarillo, Texas, in Hutchinson, Moore, and Potter counties, was formed in 1965 by impoundment of the Canadian River. Although its surface area at conservation pool is 6,477 ha, the reservoir level has fluctuated radically since initial impoundment. Topography of the lake basin ranges from relatively flat flood plain to stark relief of rugged canyons. The reservoir has a maximum depth of 39 m at conservation pool and has steep sides. The majority of the shoreline is littered with rock and boulders. Aquatic vegetation is extremely limited. The game fish community consists primarily of walleye, white bass (*Morone chrysops*), white crappies (*Promoxis annularis*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*M. salmoides*) and channel catfish (*Ictalurus punctatus*). Gizzard shad (*Dorosoma cepedianum*) is the most abundant forage.

Greenbelt Reservoir is a 806-ha impoundment on the Salt Fork of the Red River, 74 km east of Amarillo in Donley County. Topography of the lake basin grades from gentle to moderate relief. This reservoir, impounded in 1967 (maximum depth of 27 m at conservation pool), is moderately deep, clear, and supports dense stands of aquatic vegetation in littoral areas. The game fish community consists primarily of white bass, walleyes, white crappies, largemouth bass, smallmouth bass, channel catfish and northern pike (*Esox lucius*). Gizzard shad and inland silversides (*Menidia beryllina*) are the dominant forage species.

White River Reservoir is a 891 ha reservoir located 74 km east of Lubbock, Texas, in Crosby County. The reservoir was completed in 1963 by impounding the White River, a tributary of the Salt Fork of the Brazos River. The topography of the lake basin grades from moderate to stark relief as a result of erosional charactertistics of the associated High Plains caprock area. The reservoir is clear and moderately deep (maximum depth of 17 m at conservation pool). Dense vegetation growth occurs in littoral areas throughout

the growing season. Primary sport fishes in the reservoir are white crappies, walleyes, largemouth bass and channel catfish. Inland silversides and sunfishes (*Lepomis spp.*) are the most abundant forage species.

Methods

Three walleye stocking techniques were employed (Table 1). Small numbers of fry were stocked in Lake Meredith as the reservoir was initially filling. Fingerlings were stocked into an established fish community in Greenbelt Reservoir 7 years after impoundment. Frye were mass stocked into an established fish community in White River Reservoir 16 years after impoundment. The times at which walleye fisheries were considered established were subjectively determined by interviews with reservoir concessionaires.

Fishing pressure and harvest were estimated on each reservoir after walleye fisheries were established. These estimates were determined through daylight to dark creel surveys consisting of fishermen interviews (for catch estimates) and roving fishermen counts (for pressure estimates). Creels were conducted on randomly selected week and weekend days from April 1 through June 30 during survey years (Table 2). Five weekend days and 4 weekdays were surveyed on each reservoir during this period. This sample size is estimated to provide a 15% coefficient of variation (95% level) on total pressure. These surveys provided estimates of total fishing effort, fishing effort directed specifically toward walleyes, and number and weight of walleyes harvested.

Costs to establish walleye fisheries included expenses for equipment and labor to procure and hatch eggs, to rear fry or fingerlings, and to stock reservoirs. Values of walleye fisheries were determined by multiplying the monetary value of a man-hour of recreational fishing ($28 per day in Texas or $7 per man-hour, U.S. Dep. Int. 1980) by number of man-hours fishing for walleyes.

Table 1. Walleye stocking sizes, rates, and years used to establish walleye fisheries in Meredith, Greenbelt, and White River reservoirs.

Reservoir	Stocking size	Stocking rate (*N*/ha)	Year of stocking	Reservoir age at stocking
Meredith	fry	165	1965	0
	fry	659	1966	1
Greenbelt	fingerling	124	1974	7
	fingerling	124	1976	9
White River	fry	2,759	1979	16
	fry	6,150	1980	17

Table 2. Creel survey statistics for walleye fisheries on 3 Texas reservoirs surveyed from April through June.

Reservoir	Year surveyed	Size (ha)	*N* harvested/ha	*N* harvested/ man hour	Kg harvested/ ha	Kg harvested/ man hour	Hours seeking	% Total hours seeking walleye
Meredith	1981	3,856	5.231(1.511)[a]	0.179(.038)	2.428(0.577)	0.083(0.011)	68,518(17,575)	60.8(10.0)
Greenbelt	1981	806	0.739(0.410)	0.009(.003)	0.417(0.229)	0.005(0.002)	7,870(1,763)	11.3(2.0)
White River	1982	891	5.807(1.599)	0.097(0.021)	2.539(0.764)	0.042(0.010)	14,807(3,708)	30.1(5.6)

[a] Standard errors are in parenthesis.

Results and Discussion

A walleye fishery developed in Meredith Reservoir 3 years after fry stocking (Crabtree 1967, 1969). Although the technique of stocking fry at low densities has met with almost no success in other Texas reservoirs, this fishery developed rapidly as an apparent result of stocking into a new reservoir which had an expanding forage community and limited competition and predation. Walleyes have since become the major sport fish in Meredith Reservoir. A creel survey in 1981 indicated this fishery provided over 68,000 hours of recreation to fishermen seeking walleyes; 60% of all man-hours spent fishing on the reservoir were spent seeking walleyes (Table 2). Meredith Reservoir provides the best walleye fishery in Texas and compares favorably to the well-known fishery of Oneida Lake, New York (Forney 1978). The Oneida Lake fishery yielded an average of 5.6 kg/ha per year while the Meredith fishery yielded 2.4 kg/ha in only a 3-month period.

The Meredith walleye fishery cost $5,358 to produce and provided $479,626 recreational benefit during 3 months, yielding a cost-to-benefit of 1:89. The total benefit of this fishery cannot be determined because natural walleye reproduction should sustain this fishery and its benefits indefinitely.

In Greenbelt Reservoir, natural walleye reproduction occurred every year beginning 3 years after fingerlings were introduced into the established fish community (Kraai 1982). However, the walleye population did not provide a fishery until 7 years after stocking. The creel survey indicated 11% of all man-hours spent fishing on the reservoir were spent seeking walleyes, providing 7,870 hours of recreation.

The Greenbelt walleye fishery cost $2,680 and provided $55,251 recreational benefit during the 3-month period. A cost-to-benefit of 1:21 was obtained for this fishery. As at Meredith Reservoir, walleye reproduction should sustain this fishery and its benefits indefinitely.

The walleye fishery at White River Reservoir developed 2 years after fry were mass stocked. During the 3-month creel period, this fishery provided 16,587 hours of recreation to fishermen seeking walleyes, 30% of total man-hours spent fishing on the reservoir (Table 2).

The White River walleye fishery cost $2,450 to produce and provided $103,649 recreational benefit, a 1:42 cost-to-benefit for the 3-month period. Successful walleye spawning has not been observed in this reservoir and periodic stocking should be necessary to sustain the fishery.

Although experience with walleye stocking in Texas suggests a fishery can be established quickly and inexpensively in new reservoirs where reproduction is successful, few new reservoirs are planned in areas where reproduction can be expected. Walleye fisheries can be established in older reservoirs through fingerling stocking but higher costs of fingerlings compared to fry precludes introduction of enough fish to create a fishery in a short time. Development of dense walleye populations through natural reproduction takes

many years as was the case at Greenbelt Reservoir. The cost-to-benefit of such a stocking would improve each year because of the sustained fishery, but in the case of Greenbelt Reservoir, it took 7 years to develop a cost-to-benefit at 50% of that achieved in only 2 years at White River Reservoir with mass fry stocking.

Because natural reproduction of walleye cannot be expected in most Texas reservoirs, stocking is necessary to maintain fishable populations. Because it results in walleye fisheries much more quickly and more cost effectively than fingerling stocking, mass fry stocking is the technique recommended in Texas waters.

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