Artificial Habitat for Warmwater Fish in Two Reservoirs in Southern Idaho[1]

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ABSTRACT: Artificial habitat was introduced into two Southwestern Idaho reservoirs to provide structure and cover for warmwater fish. Artificial habitat consisted of concrete, car tires, tree stumps and discarded Christmas trees. Electrofishing results indicated game fish densities were five to eight times greater around the structures than along natural shorelines.

INTRODUCTION

Fisheries biologists long have been interested in manipulating structure in standing water to enhance fish populations (Hubbs and Eschmeyer 1938). Use of structure as a fishery management tool stems from evidence that suggests structure may be limiting for fishes in some lakes, reservoirs, and ponds (Prince et al. 1977). A variety of artificial structures have been placed in waters considered deficient in natural structures (Mangas 1959; Brouha 1974; Prince and Manghan 1979; Mitzner 1984; and McGurrin 1986).

This paper describes the use of artificial habitat in two reservoirs in Southwest Idaho. The first, Lake Lowell (fig. 1) is located on Deer Flat National Refuge and is a shallow (maximum depth 11.6 m) and generally polymictic irrigation reservoir. It is 3,984 hectares at full pool and has an average irrigation drawdown of 4.9 m. From July through mid-September the natural tree and macrophyte habitat present in the littoral zone is exposed by reservoir drawdown. Annual netting of the reservoir outlet following irrigation releases revealed mature and young-of-the-year largemouth bass (Micropterus salmoides), black crappie (Pomoxis nigromaculatus), bluegill (Lepomis macrochirus) channel fish (Ictalurus punctatus) and numerous non-game species. Study objectives in this reservoir include the establishment of artificial habitat at depths below the normal drawdowns to provide holding habitat for both adult and juvenile fish, thus reducing flushing losses.

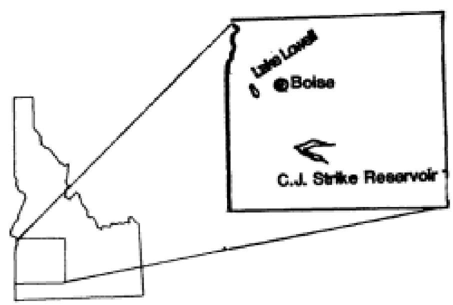

Figure 1.--Location of study areas, Lake Lowell and C. J. Strike Reservoir, in Idaho.

The second reservoir, C. J. Strike (fig. 1), is a hydroelectric reservoir operated by Idaho Power Company. It is located on the Snake River in Southwest Idaho and has 3,036 surface hectares with a maximum depth of 31.1 m. Very little water level fluctuation occurs in this reservoir. C. J. Strike Reservoir began operations in 1952 and as a result of aging has lost the original inundated woody materials and some shoreline morphology (wave action erosion) that provided both spawning and cover habitat for the endemic fishes. The study objectives in this reservoir were to; 1) establish artificial habitat to attract largemouth bass, black crappie and yellow perch (Perca flavescens) spawning and; 2) to provide a nursery area for the young fish.

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METHODS

Structures for both reservoirs were constructed during the winter using discarded automobile tires, Christmas trees (without flocking or tinsel), rejected concrete structures and apple tree stumps (generally 1 m tall and butts 30 to 70 cm in diameter). Materials for structures were located and assembled by volunteer groups who also assisted in loading and transporting the materials to and on the ice at both reservoirs. Snowmachines and all-terrain vehicles (ATV's) were used to transport tires, trees, stumps and weights onto the ice, using car hoods as sleds. Structures were placed on ice over water 6 m to 8 m deep at Lake Lowell and 2 m deep at C. J. Strike Reservoir.

When on the ice, tires were formed in groups of 24 (fig. 2, Reid and Mabbott 1987). Holes were drilled (with carbon-tipped drills) into the sides or ends of tires, depending on a tires location within the structure. Tires were then connected with a single strand of 12.5-guage galvanized wire, making certain that the drilled holes were placed upward for air drainage. Weights were attached to corners of the structure to prevent drifting. Tree stumps were positioned in a ring with large nails driven into the sides of the stumps to secure wire (fig. 2). Weights were placed in the center of the tree stump ring and attached by 12.5-guage wire. Christmas trees were either placed in a ring with all butts to the center or in a line of 15 to 20 trees (fig. 2) with the galvanized wire being used to interconnect each tree to a central wire and weights. Weights were of two types, either bags filled with sand or gravel, or cement donated by a local cement company. The cement was poured in 18.9 liter (5 gal.) plastic buckets with wire handles being secured in the cement before it hardened.

Concrete forms were secured in the spring and summer from local concrete companies and transported to the lake shoreline on flatbed trucks. A large front-end loader (some concrete blocks weighed as much as 4550 kg) then unloaded the flatbeds and tranported some of the concrete to the waters edge. Concrete was then ferried to the waters edge using a large helicopter with a support team. Structure was placed in a zig-zag (vvv) pattern, perpendicular to the shoreline and into the water.

Fish were collected using a boat-mounted electric fishing unit consisting of a 5 KW generator, a Coffelt VVP-2E pulsator, a single negative electrode and a single mobile positive electrode, which also served as a dip net. We held all captive fish in a 340.7 l (90 gal.) live well or two 124.9 l (33 gal.) plastic garbage containers. From each game fish captured, we obtained total length (in millimeters) and type of structure from which it was sampled. Natural shorelines and each type of structure were sampled one to four times during the summers of 1987 and 1988.

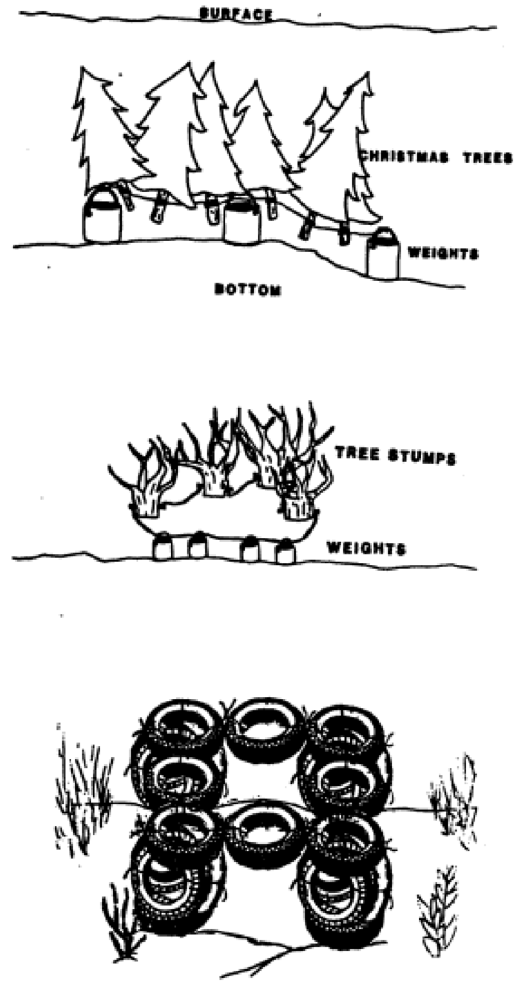

Figure 2.--Tree, stump and tire structures used for artifical habitat, 1986-1989.

RESULTS

Artifical habitat structures generally sank at ice-out in the proper locations. Some tire and tree structures were destroyed by wind and ice action. Many of these were reassembled and relocated during summer sampling.

Low water levels during late summers of 1987 and 1988 allowed sampling of artificial structures placed in Lake Lowell. Game fish densities over artificial structures were five to eight times that of the natural shoreline in Lake Lowell (fig. 3). Densities of all largemouth bass over habitat structures were up to four times greater than along natural shorelines. Large bluegills (>130 mm) were up to 24 times more numerous over artificial habitat (fig. 4 and 5).

Similar results were found in C. J. Strike Reservoir. Largemouth bass were found to be one-half to ten times more abundant in the artificial structure areas (fig. 6). Bluegill were more abundant along natural shorelines, but bluegill densities per unit area sampled were greater around artificial structures (table 1). Smallmouth bass (Micropterus dolomieui) were not attracted to the Christmas trees structures in C. J. Strike (table 1).

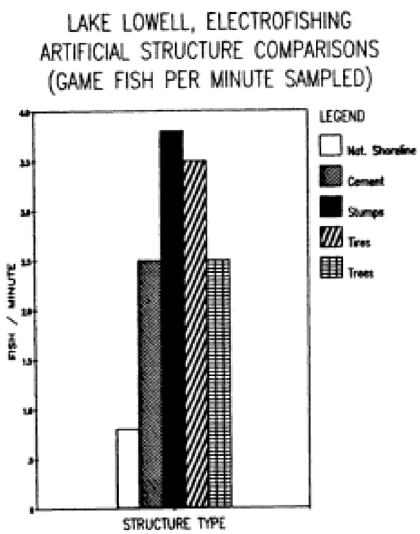

Figure 3.--Game fish sampled over artificial structure in Lake Lowell, 1988.

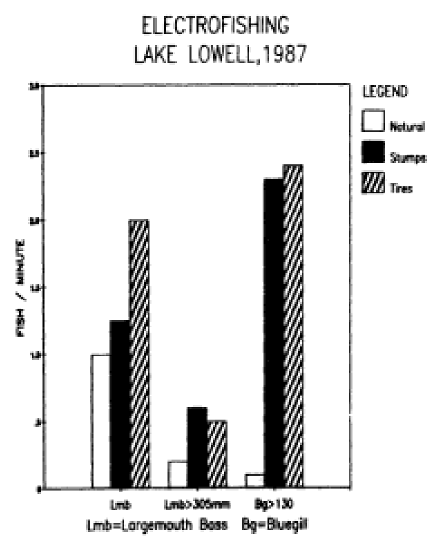

Figure 4.--Largemouth bass and bluegill sampled in Lake Lowell, 1987.

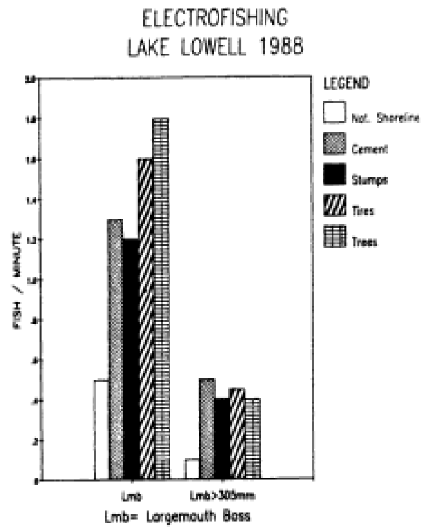

Figure 5.--Largemouth bass sampled at Lake Lowell, 1988.

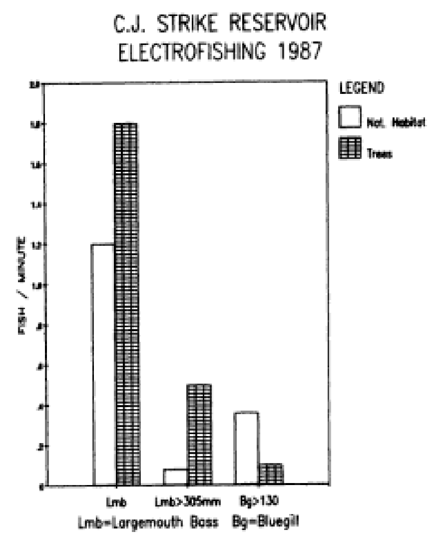

Figure 6.--Largemouth bass and bluegill sampled at in C. J. Reservoir.

Comparisons of young-of-the-year black crappie (<200 mm), bluegill (<130 mm), and yellow perch densities in structure and along the shoreline demonstrate that artificial habitat provided important nursery habitat for young fish (table 1). Actual use by spawning fish was not determined.

Habitat Type	Water Depth (m) Max	Min	Distance Sampled	Time Sampled	Lmb Tot	Lmb >305	Bg Tot	Bg >130	Smb	Tot Cr	Cr >200	Tot YP
Christmas Trees	2	1	50	30	54	15	43	3	2	261	4	45
Natural Shoreline	2	.3	370	20	23	1	25	7	2	1	0	4

Smallmouth bass sampling over and near Christmas trees placed in 1986.

					Smb Tot	Smb >305
Christmas Trees	3	1	50	20	2	0
Natural Shoreline	2	1	200	30	35	7

Lmb = Largemouth bass Smb = Smallmouth bass YP = Yellow perch
Bg = Bluegill Cr = Black crappie

Table 1. Game Fish sampled over natural shoreline and artificial habitat at C. J. Strike Reservoir, 1987.

DISCUSSION

All artificial substitute materials were successful in concentrating game fish, but each required different efforts for success. Trees and tires were readily available but required large amounts of volunteer labor for successful completion and follow-up. Stumps and concrete required additional services and equipment to transport the materials to the selected waters. Each material has its own longevity, with trees being effective 4-7 years, stumps 20-25 years (personal observation) and tires and concrete much longer.

Waters must be studied prior to introductions of artificial habitat. If the limiting factor is habitat, then availability, longevity, and suitability for the fish species and age class targeted must be evaluated to determine the type and location of introducted artificial habitat. Installation of habitat structures succeeded in concentrating game fish and may have enhanced angling success. Angling effort and public interest increased on each reservoir during the four years of this habitat enhancement program.

The use of volunteers for habitat construction and installation was successful but volunteers had to be trained to perform safe and finished work. Close supervision provided the key to successful projects. This allowed the concerned public and resource managers to interact, providing a valuable asset for future resource management.

Permission and in some cases, release forms must be signed before materials can be placed in waters or even transported to targeted waters.

It is somewhat difficult to compare the structure types directly because they differ in so may ways (height, depth, openness, bottom area covered, material dispersion, and effective surface area, etc.). However, it does appear that concentration of material and effective surface area are more important than basic material differences in terms of fish populations. The structures were effective in concentrating fish, but we believe each reservoir would require many more years of habitat introductions at current rates to significantly increase total fish populations.

ACKNOWLEDGEMENTS

Will Reid, currently Fisheries Program Coordinator for Idaho Department of Fish and Game, initiated this artificial habitat program in 1983. His concern for the resource and work with the public set the stage for the successful habitat enhancement efforts described in this report. The author is grateful to W. Reid, S. Leathe, J. Jourdonnais and F. Pickett for reviewing and early draft of the manuscript. The assistance of Dave Parrish and Tim Schultz in drafting the figures is appreciated. Funding for the projects came from the Idaho Department of Fish and Game and the Idaho Bass Federation. The data used in this study was taken from Job Performance Reports for the Idaho Department of Fish and Game, Region 3, 1986 through 1990.

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