Restoration of Warm Water Lakes and Ponds on the National Forests in Mississippi and Louisiana

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Abstract: The U.S. Forest Service has been trying to improve the fish population structure of 120 flood control lakes and ponds in the National Forests of Mississippi and Louisiana. Recent efforts have included supplemental stocking, complete eradication of existing populations followed by restocking, and selective species eradication. Since 1978, 36 lakes, 25 ponds and 59 livestock and wildlife watering ponds varying in size from 0.1 to 940.5 ha have undergone fish population alteration. Fifty-three of these lakes and ponds were completely restocked, while 57 have received supplemental stocking. Preferred species combinations in restocking programs have been largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*) and redear sunfish (*L. microlophus*), and channel catfish (*Ictalurus punctatus*) at rates of 20,200,20, and 12–45/ha respectively. Supplementally stocked species have been largemouth bass (*M. salmoides*), spotted bass (*M. punctulatus*), Florida bass (*M. salmoides floridansis*), blue catfish (*I. furcatus*), channel catfish (*I. punctatus*), and redfin pickerel (*Esox americanus*). In 84% of improved lakes and ponds, angler success has markedly improved. In supplementally stocked lakes, channel catfish stocked at 12–20/ha have increased angler harvest and angler use days by 28%. Addition of redfin pike at 2/ha has diversified fishing interest in several dystrophic lakes. Supplemental stocking of blue catfish in small watering ponds is intended to reduce overcrowded sunfish populations. Eradication of gizzard shad (*Dorosoma cepedianum*), golden shiners (*Notemigonus chrysoleucas*), and lake chubsuckers (*Erimyzon sucetta*) in 4 lakes has revitalized stunted bluegill and redear sunfish populations.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 39:269–276

Increased angler demand has led to the need to expand recreational fishing opportunities in Mississippi and Louisiana. Not only must angler access to existing

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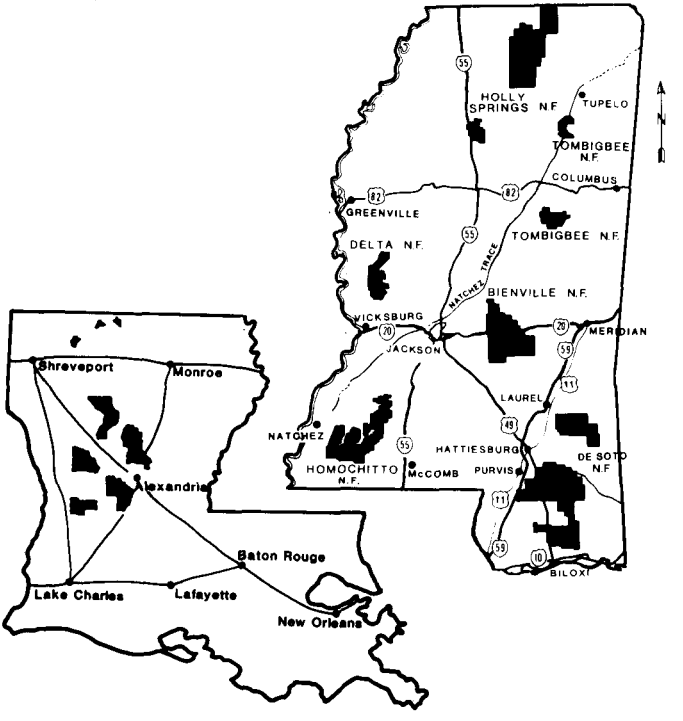

Figure 1. Vicinity maps for the National Forests in Mississippi and Louisiana.

lakes and ponds be expanded, but waters not previously considered suitable for fishing must be re-evaluated and improved to meet increased public demand.

There are approximately 461,540 ha of National Forest land in Mississippi and 242,106 ha on the Kisatchie National Forest in Louisiana (Fig. 1). Since the early 1950s the U.S. Forest Service has cooperated on construction of flood retarding structures under Public Law 566, constructed small ponds and livestock ponds, and impounded numerous recreational lakes on the National Forests. The purpose of many of the lakes and ponds has been flood control and wildlife and/or livestock watering, but several large reservoirs have been further developed as recreational facilities.

PL-566, Natural and Recreational Lakes

Farquhar et al. (1980) stated that more than 13,200 floodwater-retarding structures have been constructed nationwide by the U.S. Department of Agriculture Soil Conservation Service under Public Law 566. While the primary purpose for their construction was to reduce flooding by excess watershed runoff, ownership of the lakes has reverted to local landowners in many areas. These flood retarding lakes are primarily utilized for fishing and recreational activities on National Forest land. Ac-

cepted fisheries management practices for these structures are lacking (Noble et al. 1979), primarily due to an absence of available information on small watershed lakes. Hatcher (1973) discussed the importance of these lakes to fish and wildlife stating that large watershed to lake area is a limiting factor to fish populations. Flood control lakes on Forest Service lands in Mississippi and Louisiana range in size from 8 to 2,100 ha. Since the original stocking in the early 1950s, many of the lakes have received little management input.

Natural lakes on the National Forests are very similar in makeup to the flood retarding reservoirs. Many are natural lakes—spring-fed, often deep, clear, acidic, and containing abundant aquatic vegetation. Others are oxbow lakes formed by old river channel bends or are impounded streams, constructed for recreational purposes, covering low, flat, hardwood bottoms. Several lakes (1 to 110 ha) have recently been or are nearly completed.

Ponds

The Forest Service in Mississippi and Louisiana has acquired its pond acreage primarily through land acquisition in the early 1940s. Many of the ponds were used in private timber operations and have been in disrepair for years. Numerous Forest Service ponds have also been constructed for recreational purposes in rural areas. Average size of the ponds is between 0.4 to 5.0 ha.

Livestock and Wildlife Ponds

As part of the range and wildlife programs on the National Forests in Mississippi and Louisiana, livestock and wildlife watering holes have been constructed. These areas, primarily constructed through blasting and excavation, vary in size from 0.1 to 0.8 ha. Until the late 1970s, the ponds were not considered as potential fisheries habitat.

Methods

The U.S. Forest Service initiated lake and pond surveys on National Forests in Mississippi and Louisiana in 1978. These surveys have been used to determine fish species composition and management strategies. Fish samples were collected from 1978 to July 1985 using seines, gill nets, electrofishing, and rotenone. Representative specimens were preserved in the field in 10% formalin and later transferred to 70% propanol and deposited in the freshwater fishes collection of the Jackson Mississippi Museum of Natural Science. Rotenone population studies were conducted by blocking off an area with a block net and killing the fishes inside the enclosure. Two day pickups were conducted on all rotenone/black netting samples. Fish were recorded per species group in length (mm) and weight (g) categories following both day pickups. Seine population samples were conducted using a 15.3 m bag seine and 4.6 m seine. All fish were identified and measurements recorded in the field. Two to 4 such samples were usually taken. Electroshocking for population estimates was conducted using a Coffelt VVP-2E electroshocker in large ponds and

Table 1. Lakes, ponds, and watering ponds receiving population alteration on the National Forests in Mississippi and Louisiana (1978–1985).

Ranger District	Number	Acres	Activity[a]	Species[b]
Kisatchie	14	28	SS,RS	LMB,BG,RE,CC,BC
Tombigbee	5	334	SS,RS	LMB,BG,SB,CC,C,GC
Strong River	5	130	S,SS,RS	LMB,BG,RE,CC,C
Holly Springs	15	728	S,SS,RS	LMB,BG,RE,CC
Caney	3	1510	SS	YB,CC,BC,C,SB
Evangeline	2	2770	SS	SB,CC,C
Winn	54	2326	S,SS	SB,CC,C,LMB,BG,BC
Delta	5	80	SS,RS	LMB,BG,C
Bude	1	12	SS	CC
Homochitto	2	70	S,SS	LMB,BG,RE,CC
Biolxi	8	22	S,SS,RS	LMB,FB,BG,RE,CC,RP
Chickasawhay	1	260	SS	CC
Black Creek	5	15	S,SS	LMB,BG,RE,CC
Total	120	8285	S,SS,RS	LMB,YB,SB,FB,BG,RE, CC,C,GC,RP,BC

[a]S = Stocked (new lake); RS = Restocked (following lake rotenone); SS = supplemental stocking
[b]LMB = Largemouth Bass; YB = Yellow Bass; SB = Spotted Bass; FB = Florida Bass; BG = Bluegill; RE = Redear Sunfish; CC = Channel Catfish; C = Black Crappie; GC = Grass Carp; RP = Redfin Pike; BC = Blue Catfish

reservoirs. In small ponds and livestock and wildlife watering ponds either a Coffelt BP-3 or VVP-2C was used. Electroshocking samples of 2,600 seconds continuous shocking time were used in population evaluation. All stunned fish were measured, weighed, and, in 2 lakes, fin clipped before being released. Dissolved oxygen, pH, temperature, and conductivity were measured concurrent with fish collections.

Stocked fish (fingerlings, juveniles, and adults) were obtained from U.S. Fish and Wildlife Service, state fish and game commissions, and private hatcheries in Mississippi and Louisiana. Channel catfish, blue catfish, redfin pickerel, largemouth bass, Florida largemouth bass, bluegill, and redear sunfish were stocked. Gizzard shad, golden shiners, and lake chubsuckers had been removed from lakes using rotenone (0.1 to 0.3 mg/liter). Angler creel data was collected on 5 National Forest lakes. Fishermen were questioned on site during the springs and summers of 1983–1985. Census forms specified fish size, number of species, and angler fishing experience.

Population data was analyzed using At, F/C, and Y/C values (Swingle 1950), PSD values (Anderson 1976), and population and length frequency values (Schnable 1938) (Table 1). Angler surveys were tabulated as numbers of fish caught and fishing experience.

Results

Since 1978, 36 lakes, 25 ponds, and 59 livestock and wildlife watering have been stocked with various species of fish, at varying ratios, in the restoration of lakes and ponds on the National Forests in Mississippi and Louisiana (Table 1). The

most widely stocked species, channel catfish, has been stocked in 92% of the lakes and ponds at rates of 12 to 45 fish/ha. Three species, striped bass (*Morone saxatilis*), yellow bass (*M. mississippiensis*), and grass carp (*Ctenopharyngdon idella*) were stocked prior to 1976. Florida largemouth bass and redfin pickerel were stocked in ponds on the Biloxi Ranger District in south Mississippi, while blue catfish were supplementally stocked in wildlife and livestock watering ponds for control of stunted sunfish populations on 2 Ranger Districts in Louisiana. Spotted bass and largemouth bass were supplementally stocked in several lakes on Ranger Districts in north Mississippi and central Louisiana for rough fish control and increased angler success.

In 84% of renovated lakes and ponds surveyed for angler success, catches of sport species were increased. Primary species caught were largemouth bass, Florida largemouth bass, redear sunfish, bluegill, and channel catfish. Angler success was based on numbers of fish and angler comment as to fishing experience (either a good or excellent response constituted a successful trip). In lakes supplementally stocked with channel catfish, angler use and angler harvest were increased 28% (Fig. 2). Channel catfish stocking in these shallow turbid lakes and ponds was primarily a put and take venture. Channel catfish have been most successfully stocked at lengths of 200 to 300 mm, thus reducing predation by largemouth bass and decreasing the time needed to enter a catchable-size class.

In several dystrophic lakes on Ranger Districts in south Mississippi, redfin pickerel were stocked at 2 per hectare in ponds where physicochemical parameters

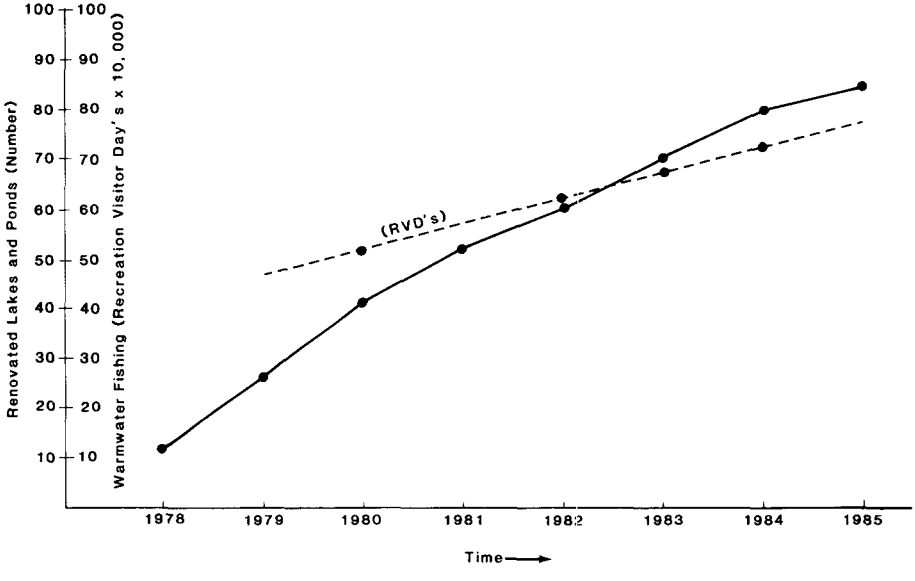

Figure 2. Renovated lakes and ponds, and angler use per year—National Forests in Mississippi (1978–1985).

were too adverse to support sport species. Even though the redfin pickerel at maturity seldom exceeds 0.9 kg, angling for this fish is enjoyable.

Eradication of gizzard shad, golden shiners and lake chubsuckers in several lakes at rotenone concentrations of 0.1 to 0.3 mg/liter has stimulated growth in stunted bluegill and redear sunfish populations. Supplemental stocking of 300 to 500 mm largemouth and spotted bass has increased predation on remaining rough fish populations and also increased angler interest in 2 "revitalized lakes."

Discussion

Anderson (1971) in his definition of fishery management includes the manipulation of biotic factors in an aquatic environment to achieve sustained production and yields of desirable species of fish. This concept should be based on sound biological, political, and economic concepts and principles. Stocking as a management objective should have an important influence on a management program. Tang (1970) suggests that increasing species diversity will lead to higher productivity. This may be noticed in the addition of redear sunfish and channel catfish to largemouth bass—bluegill combinations in ponds. Anderson (1971) stated that diversity in sport fish stocking programs increases potential sustained biomass yield, increases angling effort, and increases esthetic and sporting values of lakes and ponds.

The reservoirs, lakes, ponds, and watering ponds surveyed in this study varied in size, fish population structure, accessibility, location, and water quality. All surveyed lakes and ponds were initially classified as to balance or unbalance following either Swingle (1950) or Anderson (1978) methodology. Then, on a prioritized basis (public access) the waters received either restocking or supplemental stocking. Lakes and ponds that have been completely restocked have received increased angler use. Angler use days for 3 south Mississippi lakes increased by 40%, while supplementally stocked ponds in the same area received only moderate increased use (Table 1).

In Mississippi and Louisiana, due to the agribusiness industry, channel catfish are considered a cash crop rather than a sport species. However, channel catfish are very popular with many rural anglers fishing Forest Service lakes and ponds. This species, supplementally stocked in Forest lakes and ponds has greatly increased angler use and harvest of bass and bream (Fig. 2). This situation may be compared with Anderson's (1971) comments concerning the stocking of fish species (what and where) being determined by environmental considerations, economic values, and angler preference.

Restocking lakes and ponds which are out of balance (Swingle 1950) has revitalized interest in the Forests fisheries resources among the anglers in the 2 states (Ebert and Palmer 1981). Supplemental stocking of sport species following Proportional Stock Density (PSD) index evaluations (Anderson 1976, 1978) has been conducted to bring size classes in 2 lakes back into balance. Primary species introductions have been largemouth bass, bluegill, and redear sunfish. We have noticed that

even in small Forest Service lakes, bass anglers now use expensive, sophisticated equipment including depth sounders, fish finders, and electronic temperature and pH meters. Because of this, slot length limits (380–500 mm) to protect size classes of largemouth bass are being considered in lieu of supplemental stocking.

A combination of fisheries sample evaluations (PSD's) and creel returns were used to obtain population structure and catch data on many rural Forest Service lakes and ponds. Weiss-Glanz and Stanly (1984) comment on the efficient and effective use of PSD's and Relative Weights (Wr) (Wege and Anderson 1978) for condition factors in evaluation of data on black bass populations in Maine. We are utilizing PSD's to evaluate the large number of lakes on a yearly rotation basis, but have not used Wr data in any management strategies. As part of the Forest Management Plan (U.S. For. Serv. 1985) for Mississippi we have projected the Forests fisheries resources in lakes and ponds to outstrip demand until the year 2020. To help increase angler interest we have published fisheries stockings and management activities in state game and fish commission magazines (Ebert and Palmer 1981, Watts 1984) and local newspapers.

The role of fish stocking in fisheries management in lakes, ponds, and watering ponds on the National Forests in Mississippi and Louisiana has been to: 1) return neglected bodies of water to production, 2) increase angler interest and use, 3) sustain fish populations at harvestable levels, and 4) increase species diversity in lakes and ponds. This has been accomplished through interagency cooperation in both states. As demand for fishable waters increases in the 2 states, more pressure will be exerted on the sport fisheries in Forest lakes and ponds. We hope that by continued maintenance of the lentic waters we will be ready for increased demand.

Literature Cited

Anderson, R. O. 1971. Stocking strategies for warm water fishes in lentic environments. Pages 37–48 *in* R. J. Muncy and R. V. Bulkley, eds. Proc. North Central Warmwater Fish Cul. Manage. Workshop. Iowa Coop. Fish. Unit., Ames.

———. 1976. Management of small warm water impoundments. Fisheries 1:5–7, 26–28.

———. 1978. New approaches to recreational fishery management. Pages 73–78 *in* G. D. Novinger and J. C. Dillard, eds. New approaches to the management of small impoundments. Spec. Pub. 5, North Cent. Div., Am. Fish. Soc. Bethesda, Md.

Ebert, D. J. and A. F. Palmer. 1981. U.S. Forest Service steps up fishing plans. Miss. Outdoors Mag. 44(3):3–5.

Farquhar, B. W., R. L. Noble, and C. E. Cichra. 1980. Factors affecting fish populations in flood prevention lakes of North-Central Texas. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies. 34:292–306.

Hatcher, R. M. 1973. Floodwater retarding structures as fish and wildlife habitat. Proc. Soil Conserv. Soc. Am. 28:158–160.

Noble, R. L. Sprague, W. C. Hobaugh, and D. W. Steinbach, 1979. Pages 181–185 *in* Wildlife benefits through construction and management of floodwater retarding structures. U.S. Dep. Agric., For. Serv., Rocky Mtn. For. Range Exp. Sta. Gen. Tech. Rep. RM-65, Ft. Collins, Colo.

Schnable, Z. E. 1938. The estimation of the total fish population of a lake. Am. Math. Monogr. 45:348–352.

Swingle, H. S. 1950. Relationships and dynamics of balanced and unbalanced fish populations. Auburn Univ. Agric. Exp. Sta. Bul. 274, Auburn. 74pp.

Tang, Y. A. 1970. Evaluation of balance between fishes and available fish foods in multispecies fish culture ponds in Taiwan. Trans. Am. Fish. Soc. 99:708–718.

U.S. Forest Service. 1985. Proposed land and resource management plan for the National Forests in Mississippi. U.S. Dep. Agric., For. Serv., Jackson, Miss. 160pp.

Watts, D. L. 1984. Fishing Turkey Fork Reservoir. Miss. Outdoors. Mag. July–August: 47(4):5–8.

Wege, G. J. and R. O. Anderson. 1978. Relative weight (Wr) a new index of condition for largemouth bass. Pages 79–91. in C. D. Novinger and J. G. Dillard, Eds. New approaches to the management of small impoundments. Spec. Pub. 5, North Cent. Div., Am. Fish. Soc., Bethesda, Md.

Weiss-Glanz, L. S. and J. G. Stanley. 1984. Population structure indicies of largemouth bass and smallmouth bass determined from angler catches. North Am. J. Fish. Manage. 4:89–98.