Effects of Water Level Fluctuation on the Fisheries of Felsenthal Reservoir

Project Number 43750-1

Robert,

Prepared by

Robert,
Please coordinate filing

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and

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U.S. Fish and Wildlife Service

INTRODUCTION

A joint effort by biologists from the Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service was undertaken in FY '89 to obtain information about the fishery at Felsenthal National Wildlife Refuge. The study proposal (Appendix I) lists several objectives dealing with various aspects of the fishery in relation to water level management. Results should be interpreted as initial findings about a unique and multifaceted system created in 1985 by completion of the lock and dam on the Ouachita River by the U.S. Army Corps of Engineers. More research, including that on proposed objectives that were not addressed, is needed to evaluate responses of the fishery to water management schemes proposed through 1995 (Table I). These cooperative efforts should include state and federal entities including the Cooperative Fish~~eries~~ Research Unit at Fayetteville. Results from those studies, along with the Greentree Reservoir Monitoring Study and other pertinent information, will then be useful in water level management planning.

REPORTING OF RESULTS

Fishery information was gathered during ten weeks of field work involving personnel with the Arkansas Game and Fish Commission, Felsenthal National Wildlife Refuge and Natchitoches Fisheries Assistance Office, Louisiana. Reports of findings are presented in two parts. Part A, prepared by Don Turman and John Stark of the Arkansas Game and Fish Commission deals with standing crop, population structure and other information obtained through standardized sampling techniques. Part B, prepared by John Forester of the Natchitoches Fisheries Assistance Office concerns the temporal aspects of the sport fish spawn. General observations on the fishery with some literature citings are also presented along with information concerning the precedent of periodic lowering of water levels in Corps of Engineers reservoirs below low pool stage for vegetation control.

Recommendations are presented at the ends of Parts A and B.

PART A

FELSENTHAL NWR

1989 Annual Fish Sampling Report

Don Turman, District Fisheries Biologist
John Stark, Assistant District Biologist

EXECUTIVE SUMMARY

The fish population of Felsenthal NWR was extensively sampled during 1989 with shoreline seining, spring electrofishing, cove rotenone, creel survey, and trap netting. Sample results indicate that most desirable fish species experienced good spawning success.

Shoreline seining revealed an adequate 1989 bass spawn as well as excellent growth and survival of the 1988 bass and crappie year class. Bream spawn was virtually nonexistent during seining.

Electrofishing indicated an extremely high density largemouth bass population exists, most of which are less than 12 inches long. Spring PSDs indicated 20-25% of the catchable (> 8 inch) bass exceeded 12 inches during the spring. This bass PSD is below desirable levels. Although bluegill PSDs differed dramatically between areas, the overall bluegill PSD is close to ideal; indicating 15.9% of catchable (> 3 inch) fish exceed 6 inches.

Rotenone samples indicated that spring overflows may have benefited many desirable fish species such as largemouth bass, flathead and channel catfish, and paddlefish, allowing them to spawn successfully. In particular, high water appears to caused a phenomenal black crappie spawn and ensured good survival of the 1988 white crappie year class.

Fishing pressure from local anglers was high during both weekends and weekdays. Anglers sought bass, bream, and crappie, and experienced above average success rates.

Crappie trap netting also indicated that black crappie brought off a tremendous year class. Survival and growth of the 1988 white crappie year class appears to be good. Analysis of 1988 data indicates that white crappie grow faster than black crappie after the second year of life.

Additional management activities during 1989 included continuation of the fishery conservation water level regime, as well as the stocking of 960 catchable blue catfish in Eagle and Perogeethe Lakes within the Felsenthal NWR.

Continuing the current water level regime and supplementing the catfish population in the old river lakes through stocking of catchable blue catfish is recommended.

LAKE DESCRIPTION

Felsenthal Reservoir is a unique 15,000 acre impoundment located in the Felsenthal National Wildlife Refuge (Felsenthal NWR). The completion of the Felsenthal Lock and Dam in 1985 raised the permanent navigation pool 3.4 feet to 65 feet msl, increasing the area of the permanent reservoir from 5,000 to 15,000 acres.

The 15,000 acre lake inundated an intricate system of rivers, sloughs, bayous, and lakes separated mostly by hardwood timber. Further adding to the complexity of this system is the seasonal flooding of an additional 21,000 acres when the reservoir pool is increased 5 feet to 70 feet msl to serve as a green tree reservoir for wintering waterfowl. The current water level regime is also designed to enhance sport fish spawning and survival.

Knowledgeable fishermen have a variety of changing fishing opportunities to choose from when fishing in Felsenthal. Primary drainage and 52 miles of riverine habitat is provided by the Ouachita River and its major tributary, the Saline River, whose confluence is nearly geographically centered on the refuge. Numerous bays, sloughs, bayous, barrow pits, and lakes provide additional aquatic habitat. Five lakes including Perogeethe (55 acres), Eagle (21 acres), Buck (10 acres), Jones (34 acres) and Hoop (30 acres) are isolated from the rivers during low water. They are all subject to flooding and are inundated nearly every year.

Excellent access to the reservoir is available from nine concrete boat ramps constructed by the Corps of Engineers.

PAST MANAGEMENT

Due to the size and complexity of the felsenthal impoundment past management consists largely of fish stocking and monitoring of the fishery through population sampling. Recent management efforts have involved water level regime management and evaluation of high spring water levels on sport fish spawning and young of the year survival.

Fish Stockings

River lakes within Felsenthal NWR were stocked with fish as follows:

Date	Lake	Number	Description
1985	Pirogeethe	1,500	Catchable Channel Catfish
1986	Eagle	500	Catchable Channel Catfish
1986	Jones	500	Catchable Channel Catfish
1986	Pirogeethe	500	Catchable Channel Catfish
1987	Eagle	625	Catchable Channel Catfish
1987	Pirogeethe	875	Catchable Channel Catfish

1988	Eagle	400	Yearling Blue Catfish
1989	Eagle	420	Catchable Blue Catfish
1989	Pirogeethe	540	Catchable Blue Catfish

Water Level Management

Alterations were made to the Green Tree Reservoir regime in 1988 in order to provide for enhanced sport fish spawning and young of the year survival. Water levels are maintained at 70 feet msl (5 ft. above permanent pool) until March 1, when water levels are gradually reduced to 67 feet msl and held through April 20. Finally, water levels are lowered at one inch per day until 65 feet msl is reached about May 24. This regime is the minimum amount of water to be maintained during the spring, as it is subject to extended override by nature during years with heavy spring rainfall.

METHODS

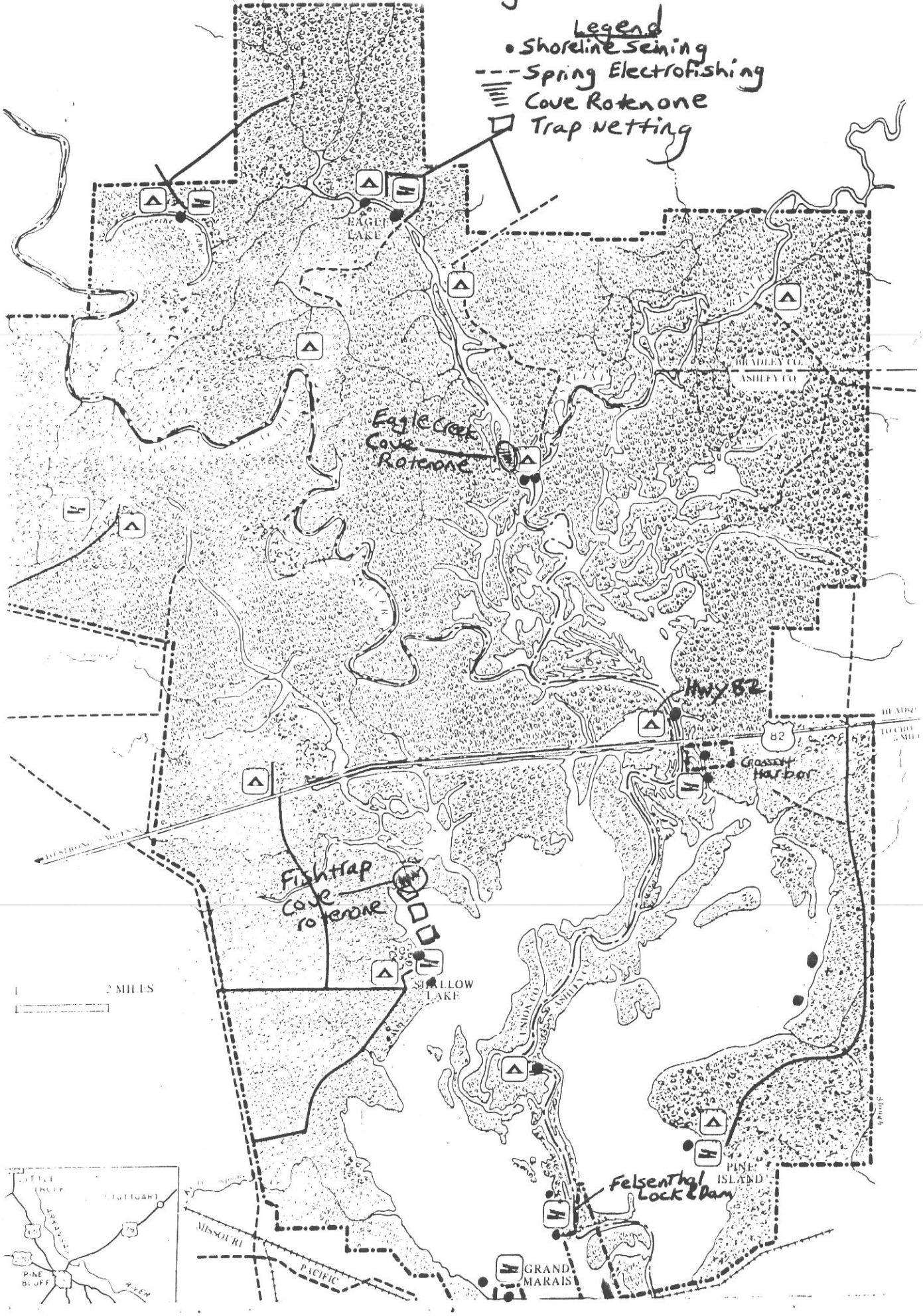
Shoreline seine samples were taken on Felsenthal NWR during June 1, 1989. Eighteen seine hauls were made at various boat ramps and campgrounds within the impoundment (Fig. 1). The majority of seining was conducted in shoreline vegetation including brush, american lotus, southern naid, and water primrose. Approximately 12.2 m (40 ft.) of shoreline was sampled at each location. Fish were then sorted by species size groups and counted.

The 1989 Felsenthal NWR electrofishing sample was conducted during the nights of March 29-30 and April 4-5. Extremely high spring water levels (83 ft. msl) inundated previously targeted sample areas, resulting in samples being taken where water levels were suited to electrofishing. Samples were therefore taken from Spring Bayou and Grand Marias representing "slough and backwater" areas, Jones Lake representing "river lakes", and the "riverine" Highway 82 and Dam area (Fig. 1).

Largemouth bass and bluegill were collected, weighed, and measured in order to obtain proportional stock densities (PSD) of the respective species.

Cove rotenone samples were taken at two locations during August 30-31, 1989. A .6 hectare sample was collected in Eagle Creek, approximately 1/2 mile from its confluence with the reservoir proper (Fig. 1). The Eagle Creek sample was thought to be representative of riverine habitat within the reservoir. The sample area ranged in depth from 3 to 12 feet. Some cover comprised of inundated brush and cypress was available on the edges of the current channel.

Simultaneously, another .6 hectare sample was conducted in the fishtrap region of Shallow Lake (Fig. 1). The fishtrap sample area exemplifies lacustrine habitat and ranged in depth from 1 to 8 feet deep. Some cover comprised of brush and downed timber, was again present near the banks of the sample area.


Legend
Shoreline Seining
Spring Electrofishing
Cove Rotenone
Trap Netting
EAGLE LAKE
Eagle Creek Cove Rotenone
ASHLEY CO
Hwy 82
82
Grassett Harbor
Fish trap cove rotenone
SHALLOW LAKE
2 MILES
PINE ISLAND
Felsenthal Lock & Dam
GRAND MARAIS
MISSOURI PACIFIC
PINE BLUFF

In both samples block-off nets were placed upstream and downstream, between banks to form oblong sample "coves". Fish were collected, sorted by species size groups, counted, and weighed. On the second day the process was repeated except for weighing.

A one year recreational use and angler creel survey was implemented on July 1, 1989. Interviews are conducted at the Highway 82 Bridge, Crossett Harbor, Shallow Lake, Grand Marias, or Felsenthal Lock and Dam. The creel utilizes volunteer labor including District 6 fisheries biologists, US Fish and Wildlife Service personnel, and Union and Ashley County wildlife officers. Creel personnel work a four hour morning, afternoon, or evening shift between 8 am and 8 pm, in which a pressure count and angler interviews are conducted. The ten day per month schedule is stratified uniformly between weekends (Friday-Sunday) and weekdays.

Black and white crappie were collected over ten net nights during September-November 1988 and the process is currently being repeated during 1989 in order to evaluate the effects of extended spring overflows on crappie spawning and survival. Crappie were collected using ten trap nets constructed with 1/2" netting stretched over two 3' x 6', 5/16" diameter steel frames with center braces and four 2.5' diameter hoops of 3/8" steel. The 3' x 6' frames are 30" apart and the first hoop is 32" from the second frame. A lead of 1/2" square knotless nylon 65' in length and 3' in depth is attached to the trap. Otoliths and scales were removed for age and growth analysis.

RESULTS AND DISCUSSION

Shoreline Seine

The June 1 shoreline seine samples revealed an adequate 1989 bass spawn (4 fish/haul). In addition, excellent growth and survival of the 1988 year class was noted. Excellent numbers of intermediate white crappie (6 fish/haul) and chain pickerel (4 fish/haul)were also collected.

The 1989 bream spawn was nonexistent at this point. Excellent numbers of intermediate sized bream (50-75 mm) were collected. Other forage fish such as inland silversides and shiner species appear to have benefited from high water levels and brought off an excellent 1989 year class.

Electrofishing

The 1989 Felsenthal NWR electrofishing sample was conducted during the nights of March 29-30 and April 4-5. During these samples 279 stocked sized largemouth bass and 113 bluegill were collected.

Bass and bluegill size structure and therefore PSDs differed among the various habitat types. Bass PSD was highest in the "slough and backwater" areas of Spring Bayou and Grand Marias at 24.8 and 21.5 respectively. Low PSD (11.8) resulted from the "riverine" sample conducted along the spillway and dam levees adjacent to the Ouachita River Channel. Although few fish were collected,

intermediate PSD results of 16.7 were obtained from samples along the Highway 82 levees and Jones Lake.

Largemouth bass PSDs, however may be more uniform than those calculated from data obtained in these samples. Length-weight data obtained from spotted bass was inadvertently recorded and included as largemouth statistics. Subsequent information obtained from a creel survey and tournament catches indicates a higher proportion of spotted bass in the proximity of the main river channel. Spotted bass have an inherently shorter body form, therefore largemouth bass PSDs calculated from spotted bass lengths will be lower than the true values. PSDs from areas thought to contain higher concentrations of largemouth such as Shallow Lake, and Grand Marias should be more accurate.

The overall refuge largemouth PSD of 20.2 is probably lower than actually is the case. Actual overall largemouth bass PSD probably equals or exceeds those obtained from the Grand Marias and Shallow Lake Samples (= 25.0). Although the estimated 25.0 PSD is lower than desired, a high density population may exist as a catch rate of 63 fish per hour was obtained. Length frequency distribution was nearly bell shaped, indicating well balanced, coexisting largemouth and spotted bass populations.

Are these reversed? →

Bluegill PSDs contrasted drastically between samples obtained from Jones Lake (29.8) and Spring Bayou (1.8). Higher bluegill densities at Spring Bayou compared to Jones Lake (catch rates of 59 fish/hr vs 35 fish/hr) may account for the extremely low PSD value from that area. The overall bluegill PSD of 15.9 is close to the desirable range. Length-frequency distribution was also nearly bell shaped indicating a well balanced population.

Cove Rotenone

Eagle Creek sample results indicate that predators comprised 48.8% (340.949 kg/ha)of the total fish weight collected. The apparently high percentage of predator biomass is most likely due to insufficient recovery of small bluegill and other bream. Shortly after rotenone was applied numerous small bream (< size 4) surfaced. However, few were present during second day pickup, leading to insufficient estimates of the forage base.

Large freshwater drum (> size 15) dominated the predator group, accounting for 23.4% (163.402 kg/ha) of the total sample weight. Largemouth bass, an important angler sought species, contributed 7.9% (55.276 kg/ha) of the sample weight. Channel catfish and black crappie comprised nearly all of the remaining predator weight, contributing 4.0% and 2.8% to the sample weight.

Largemouth bass age structure is well distributed although the intermediate size group may be somewhat scarce. High water may have contributed to an excellent bass spawn, as young of the year were collected in good numbers (128 fish/ha). Largemouth in size groups 15-18 were also present in good numbers (6 fish/ha).

Excellent numbers (20 fish/ha) of large channel catfish exceeding size 18 were collected during the 1989 sample. Channel catfish apparently benefited from high water as young channel catfish were collected in fair numbers (18 fish/ha). Few intermediated channel catfish were collected, verifying that the 1988 year class was weak. Flathead catfish also appear to have spawned well (19 fish/ha).

Black Crappie in particular appear to have benefited from the extended spring overflows. Black crappie young of the year were collected in phenomenal numbers (2595 fish/ha). Survival of the 1988 white crappie year class also appears to have excellent as good numbers of intermediate fish were collected.

Bluegill and gizzard shad dominated the forage fish, which comprised 27.6% (192.881 kg/ha) of the total sample weight. Bluegill accounted for a large portion of the forage at 11.3% (79.038 kg/ha) of the sample. Large gizzard shad made up the remaining bulk of the forage, comprising 11.2% (78.354 kg/ha) of the sample weight. Both bluegill and gizzard shad exhibited a poor 1989 spawn.

Commercial fish accounted for 23.7% (165.421 kg/ha) of the total sample weight. Paddlefish dominated the commercial fish, comprising 10.6% (73.935 kg/ha) of the sample. Paddlefish also apparently brought off a good 1989 year class, as eight young of the year were collected. Large bigmouth buffalo in size groups 23-31 contributed a significant amount of biomass at 8.7% (60.492 kg/ha) of the total.

Unlike the riverine sample, forage fish such as gizzard shad, bluegill, warmouth, and redear sunfish dominated the lacustrine fishtrap sample; comprising 42.2% (274.549 kg/ha) of the total weight collected. Gizzard shad accounted for 20.8% (135 kg/ha) of the sample weight. Most of the gizzard shad were intermediate or large fish. Few young of the year were collected (100 fish/ha), indicating a poor 1989 spawn and/or survival. Interestingly, threadfin shad which accounted for a significant amount of forage in prior years were also poorly represented (154 fish/ha).

Bluegill accounted for 14% (90.855 kg/ha) of the total weight. The 1989 bream spawn was not as strong as in previous years, however; good numbers of large bluegill in size groups 7-9 were collected (153 fish/ha). Warmouth and redear sunfish accounted for the bulk of the remaining forage at 3.4% and 2.2% of the total sample weight respectively.

Predator fish accounted for 34% (221.039 kg/ha) of the sample biomass. Large, adult freshwater drum in size groups 11-19 dominated the predator group; comprising 18% (117.128 kg/ha) of the sample. Few intermediate or young drum were collected.

Largemouth bass were present in very good numbers (255 fish/ha) and contributed 5.1% (33.271 kg/ha) of the total sample weight. Largemouth bass size structure appears to be fairly well balanced with a good spawn (158 fish/ha), and an extremely strong adult group in sizes 10-17 (48 fish/ha).

Catfish contributed almost an equal amount of biomass (5.2%). Once again it appears that both flathead and channel catfish benefited from high water. Channel catfish in particular appear to have brought off an extremely strong 1989 year class (423 fish/ha). Extremely large flathead in size groups 24-28 were also collected in good numbers (7 fish/ha).

Interestingly, the combined weight of black and white crappie was nearly equal to bass and catfish weights, at 5.4 % of the total. Black Crappie young were once again collected in phenomenal numbers (3762 fish/ha). White crappie age structure was fairly well balanced, with a strong intermediate group (90 fish/ha) originating from the 1988 year class.

Commercial fish such as bigmouth buffalo once again accounted for a significant amount of biomass at 23.8% (154.993 kg/ha) of the total sample biomass. Large bigmouth buffalo (size 23-28) dominated the commercial group at 21.1% (137.213 kg/ha) of the sample weight. Three young of the year paddlefish were also collected.

Creel Survey

Due to the ongoing nature of the creel survey data analysis has not been completed, however; several preliminary trends appear evident. Anglers are primarily local (< 30 mi.) and experience above average success. Both findings can probably be attributed to the complexity of Felsenthal NWR. Many of the anglers grew up fishing the reservoir and know where to fish and what tactics to use. Angler preferred fish appear to be bream, bass, and crappie.

Trap Netting

During the 1988 pilot year study 148 white crappie and 87 black crappie were collected. The 235 fish total or 23.5 fish per night average was low and indicates crappie densities were probably at a low point. Interestingly, more white than black crappies were collected until late October (Fig. 2). Many of the white crappie collected early were young of the year (Age 0) or yearling fish (Age 1+). Late in the trap netting season few fish were taken and these were very large older crappie.

Both scale and otolith measurements indicate white crappie grow faster than black crappie after the second year of life (Table 1). These specific differences may be due in large part to the diet of the different species when mature. Previous studies by Ball and Kilambi (1972) and Ellison (1984) indicate that white crappie undergo a dietary shift from zooplankton and insects to fish when they exceed 200 mm, giving them a growth advantage. Dietary shift probably accounted for specific differences, as an abundant threadfin and gizzard shad forage base was available during the 1988 sample year.

The 1989 trap netting season is currently underway. Preliminary results corroborate the existence of a phenomenal 1989 black crappie

year class and the excellent survival of the 1988 white crappie year class. Trap netting also has revealed the presence of fairly strong bream spawn late in year.

Lake Summary:

Analysis of the combined riverine and lacustrine samples indicates extended spring overflows benefited many desirable fish species. Largemouth bass, flathead and channel catfish, black crappie, and paddlefish all appear to have spawned successfully. High water also appears to have ensured good survival of the 1988 white crappie year class. Forage fish such as bream and gizzard shad experienced poor spawning success and/or survival. Few young bream were collected until late in the 1989 year, during trap netting. Threadfin shad abundance has declined dramatically from 1988 levels.

Due to the large numbers of predators (bass, catfish, crappie, and drum) and a poor forage spawn there may be a shortage of forage for predators in size groups 9-12, as indicated by AP/P ratios. It is possible that adequate forage still exists, as insufficient recovery of intermediate bream in the Eagle Creek sample may have skewed the overall predator prey balance on the combined AP/P plot.

However, less than desirable electrofishing PSDs do indicate that the high density bass population may be experiencing competition, resulting in fewer than desired quality sized fish.

Currently, the fishery of Felsenthal Reservoir appears to be in good shape, despite potential competition problems. If the 1990 forage fish reproduction is adequate, Felsenthal NWR has the potential for producing excellent numbers of bass, catfish, and crappie for years to come. The commercial fish population also appears to be capable of supporting a continued commercial fishery.

RECOMMENDATIONS

Due to the size and complexity of the Felsenthal NWR impoundment, few management alternatives are practical; however, the following actions should be taken:

1. Continue the current water level regime and monitor the effects of extended spring overflows on desirable fish species, using standard sampling procedures and trap netting. Data gathered will eventually be used to formulate a water level management plan that optimizes spawning success and survival of desirable fish species.

2. Continue to supplement the catfish population in the old river lakes through the stocking of 1,000 catchable blue catfish in each of Eagle, Jones, and Perogeethe Lakes.

JS:js

Rec'd from Don Turman, AGFC - 1/9/86

INTERPRETATIVE MAP

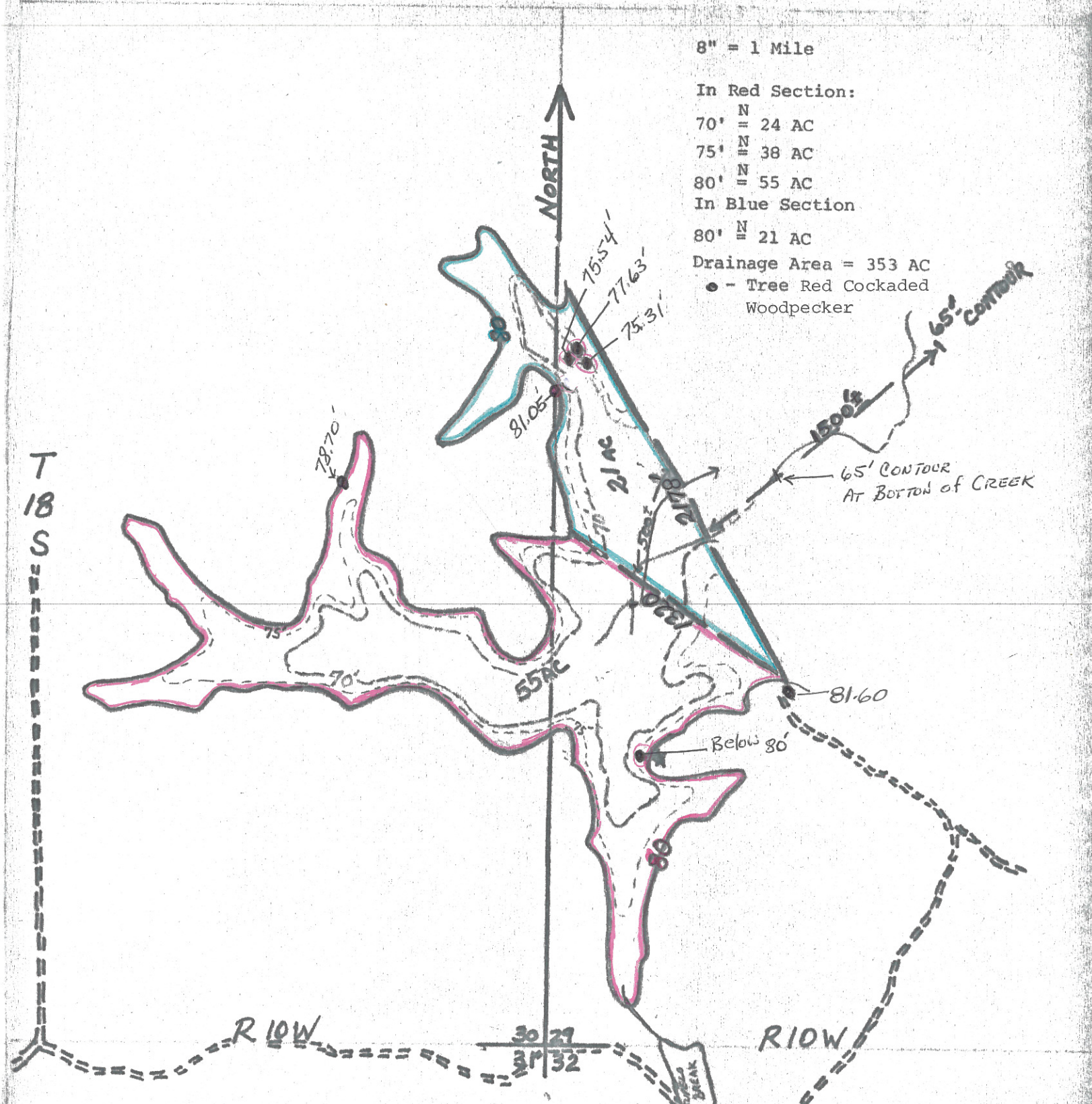
Approx. Scale 1" = 660'

Prepared By

USDA, SOIL CONSERVATION SERVICE COOPERATING WITH THE STATE AGRICULTURAL EXPERIMENT STATION AND THE Union County SOIL & WATER CONSERVATION DISTRICT

Owner US F&W Operator same Date Feb 1, 1981

County UNION State Arkansas Photo or Sheet No.



File: Ref. Mgt.; Fish - Fish Nursery Pond Mgmt.

X

X Area Manager, Area 3, Jackson, MS X

Acting Project Leader Felsenthal NWR, Crossett, AR 9/22/81

Archeological Sites - Fish Nursery Pond

Hester Davis letter - Filed in Legal, Arch. + Hist. Preserv. Act.

Attached material for your information.

TABLE I

3-22-89

Re: Fisheries Research Proposal on Felsenthal NWR

Telecon with Dr. Cynthia Annett, Fish & Wildlife Co-op Unit, Fayetteville, AR

Made verbal commitment that we (refuge) would provide assistance in a long-term fisheries study on Felsenthal Refuge (by graduate students through the Co-op Unit) by providing:

(1) Camper trailer for lodging while on-site (probably hooked up at shop).

(2) Boat (but no promise re: motor).

(3) Office space (using "carpentry room" of new shop) and restroom facilities.

They are looking at a 5 to 6 (preferable) year study from FY 1990 through 1995. I gave tentative planned water management schedule as follows:

	FY89 (current year) - GTR (fall) w/spawning pool
	FY90 - No GTR; no spawning pool
Proposed	FY91 - GTR; no spawning pool
Study	FY92 - GTR with spawning pool
Period	FY93 - No GTR; no spawning pool
	FY94 - GTR; no spawning pool
	FY95 - GTR with spawning pool

This schedule, of course, would be subject to modification depending on natural flooding, evidence of stress on timber, on-going GTR monitoring study needs, etc.

Robert J. Bridges

cc: Dr. Cynthia Annett, Fayetteville, AR
John Forester, Natchitoches, LA
Sam Drake, Atlanta, GA